An Roinn Tailte

(Department of Lands)

FO-ROINN IASCAIGH

(Fisheries Division)

REPORT

ON THE

SEA AND INLAND FISHERIES

FOR THE YEAR

1960

incorporating Statistics of the Capture of Salmon, Sea Trout and Eels, and certain scientific papers relating to fisheries.

DUBLIN:
PUBLISHED BY THE STATIONERY OFFICE.

To be purchased from the
GOVERNMENT PUBLICATIONS SALE OFFICE, G.P.O. ARCADE, DUBLIN.
or through any Bookseller.

Price: Three Shillings and Sixpence

(Pr. 6047.)

An Roinn Tailte

(Department of Lands)

FO-ROINN IASCAIGH

(Fisheries Division)

REPORT

ON THE

SEA AND INLAND FISHERIES

FOR THE YEAR

1960

incorporating Statistics of the Capture of Salmon, Sea Trout and Eels, and certain scientific papers relating to fisheries.

DUBLIN:
PUBLISHED BY THE STATIONERY OFFICE.

To be purchased from the
GOVERNMENT PUBLICATIONS SALE OFFICE, G.P.O. ARCADE, DUBLIN
or through any Bookseller.

Price: Three Shillings and Sixpence

(Pr. 6047.)

NOTE:—Sea fish are divided into two categories, pelagic and demersal. The term "pelagic" (Greek: "pelagos", the sea) is applied to those fish which usually swim at or near the surface of the water. The main varieties of pelagic fish landed are herrings, mackerel and sprats. The term "demersal" (Latin: "Demergere", to plunge down) is applied to those fish which live during adult life at or near the sea bottom. The chief species landed are turbot, brill, soles, plaice, cod, haddock, hake, ling, whiting, conger eel and ray (skate). Shellfish consist of two classes, viz., molluscs, of which the main varieties gathered are periwinkles, mussels, oysters, escallops and cockles, and crustaceans—lobsters, crawfish, Dublin Bay prawns and crabs.

REPORT

OF THE

MINISTER FOR LANDS

ON THE

SEA AND INLAND FISHERIES

FOR THE YEAR

1960

PART I

SEA FISHERIES

The total value of landings of sea fish in 1960 was £1,611,605, which represented an increase of £2,918 over the figure for 1959. This increase was achieved despite a fall of £63,091 in the total value of shellfish as compared with the previous year.

Generally speaking, 1960 was not a good year for fishing because of unsatisfactory weather. From January to March conditions were poor, particularly on the west and north coasts, and even in April wild weather resulted in sporadic fishing. May and June were fair months but conditions deteriorated in July affecting all coasts and all types of fishing. The succeeding two months were also fair up to the last week in September when severe gales stopped all fishing and brought to an abrupt closure the seasonal fishing for lobsters and crawfish, following considerable losses of pots within a few days. October was fair again but the last two months of the year were very changeable and lengthy stoppages in the herring fisheries on north and south coasts resulted.

The following table gives the weight and value of the landings of all sea fish (excluding shellfish) since 1951:—

TABLE 1.

Year		cwt.	£
1960	...	688,421	1,271,980
1959	...	592,319	1,205,971
1958	...	547,377	1,025,505
1957	...	532,475	907,119
1956	...	377,367	787,160
1955	...	303,519	686,195
1954	...	254,714	635,802
1953	...	222,516	545,105
1952	...	203,000	478,774
1951	...	187,645	431,875

Appendix No. 1 gives details of the varieties landed in 1960 and Appendix No. 2 shows the average value per cwt. of the varieties each year back to 1953.

Imports of some varieties of white fish were permitted in varying quantities during the year to meet temporary shortages of home landings. Imports of herring were also allowed for consumer and industrial use when home landings were insufficient.

The ports at which the value of landings was highest were Dunmore East, Howth, Killybegs, Castletownbere, Dingle, Burtonport and Galway. Again, the herring fishery centered at Dunmore East accounted for that port's pre-eminence.

DEMERSAL FISHERY.—The quantity of demersal catches in 1960 was 24,393 cwt. lower than in 1959, the respective figures being 233,785 cwt. and 258,178 cwt. The quantity of whiting taken represented almost half the total catch and exceeded the total quantities of cod, ray, plaice and haddock which were, in that order, the varieties after whiting taken in greatest quantity. Despite the drop in quantity, the value of 1960 landings showed an increase of £18,130 on that of 1959, the figures being £818,828 and £800,698. The varieties which mainly contributed to this increase in value were haddock, cod, whiting, brill and soles. The value of landings of hake, ling, plaice, ray and turbot dropped, in proportion roughly to the fall in landings in each case. In order of aggregate value, whiting was foremost followed by cod, ray, and haddock. The unit prices were generally satisfactory, especially for hake, ling, haddock, turbot and whiting.

In general, the demand for demersal fish in 1960 continued to be good though occasional heavy landings of fish of sub-standard quality did not clear readily. This particularly applied to "slinky cod" in late spring and early summer and small ungutted whiting from east coast ports in late autumn. Good quality large round fish and prime flat fish were scarce and sold well. Quick freezing concerns continued to absorb sizeable quantities of most varieties and it is encouraging to note that this outlet is expanding as a result of wider distribution of fish products in inland areas. Sales of fresh fish direct from ports increased and the establishment of a local auction at Killybegs at the end of May resulted in more effective distribution of fish in the surrounding areas.

The trend towards trawling, which began in the previous year, continued during 1960 with more widespread use of trawls made from synthetic fibres which would seem to have the advantage of being less costly in the long run than seine net outfits. Some experiments were made with two-boat bottom trawling and these resulted in greatly increased catches of good quality round fish.

The following table shows quantity, total value and average value per cwt. of demersal fish for each of the past ten years.

TABLE 2.

Year	Cwt.	£	Average value per cwt.
			s. d.
1960 ...	233,785	818,828	70 1
1959 ...	258,178	800,698	62 0
1958 ...	258,978	717,306	55 5
1957 ...	259,722	693,330	53 5
1956 ...	225,488	660,674	58 7
1955 ...	193,916	593,190	61 2
1954 ...	169,926	540,690	63 7
1953 ...	147,757	451,901	61 2
1952 ...	134,841	397,276	58 11
1951 ...	119,055	354,536	59 7

PELAGIC FISHERY.—*Herrings*:—The Irish herring fisheries further expanded in 1960 both in quantity and value showing increases of 35% and 8% respectively compared with 1959. Dunmore East and Donegal were again the principal fishing centres, the former accounting for 70% of the total landings. Demand was good though the average unit price showed a drop of 4/9d. per cwt. to 18/11d. from 23/8d. in the previous year. The main reason for this decline was the mixed quality of herrings taken at times in the major fisheries.

The winter herring fishery at Dunmore East, valued at well over a quarter of a million pounds, covered five months, January and February, October, November and December, that is, parts of two seasons. The catch in the first two months increased by approximately 25% over the same period of the previous year and again showed that trawling at that time gave better results than ringing. The second part of the fishery, covering the last three months of 1960, began much earlier than in the previous year but the catch for the first two months of this period was not greatly in excess of that for the same two months in 1959; December landings, however, showed an increase of 150% over those for December, 1959.

The bulk of the herrings from Dunmore East went to English and Dutch markets but in December substantial quantities were also exported to Western Germany. Rough packed herrings in barrels went mainly to France while a sizeable trade in marinated herring took place with Germany. Exports of frozen whole fish to Germany were also made and a Dutch factory ship on its maiden voyage was satisfactorily used to freeze and transport herrings to Holland in December.

Off the Donegal coast the herring fishery was not quite as successful in 1960 as in the previous year. Landings at Killybegs, Burtonport, Kincasslagh and Bunbeg in January were fair but came to an end early in the month. In May a small quantity of herrings was landed at Burtonport but unfavourable weather curtailed fishing activity. No spent herrings were taken until September when, again at Burtonport, some boats landed very poor quality mixed herring which was mainly sold for fish meal. In November, landings improved at all ports but quality suffered from the presence of a fair proportion of small herring among the catches. Fishing in December was adversely affected by prolonged spells of unfavourable weather. Ring netting was the principal method used by boats operating from Killybegs, Burtonport and Kincasslagh, though late in the season trawls of both single and two boat Larsen types gained many adherents and had considerable success. Traditional drift netting accounted for catches at Bunbeg, Magheraroarty and Inver.

Due to the comparative failure of the autumn spent herring fishery in Donegal Bay, boats from Killybegs and Burtonport travelled to Clew Bay to try ring netting south of Achill Island. From late September to the end of October these vessels landed approximately 6,000 crans of herrings at Westport and, had the weather remained good, would probably have continued to fish the grounds until mid-November as shoals were still in evidence then.

The Donegal and Westport landings were utilized mainly for sale in fresh and marinated form though some freezing and rough packing were also engaged in.

Early in the year boats from Clogherhead, Skerries and Balbriggan took advantage of a run of small herring which materialised off Clogherhead, the catches being principally utilised for fish meal manufacture.

The following table shows quantity, total value and unit value of herring landings for the past ten years:—

TABLE 3.

Year	Cwt.	£	Average value per cwt.
			s. d.
1960 ...	417,414	394,945	18 11
1959 ...	308,064	364,130	23 8
1958 ...	252,759	268,579	21 3
1957 ...	233,365	173,027	14 10
1956 ...	137,849	101,608	14 9
1955 ...	96,560	73,782	15 3
1954 ...	68,322	72,848	21 4
1953 ...	58,981	70,066	23 9
1952 ...	54,947	60,451	22 0
1951 ...	49,823	56,830	22 10

Pilchards :—There were reports of pilchards shoaling in quantity off the Donegal coast during the summer months, but no fishing took place due primarily to lack of outlets.

Mackerel :—The total catch of this variety increased by approximately 11,000 cwts. over 1959 to 37,000 cwts. with a value of £58,000. The greater portion of this catch was taken off Baltimore, Schull and Union Hall from March to September, heaviest landings being recorded for the period March to June. The increase in landings in this area over the 1959 take was in the region of 70%. Most of the catch was exported fresh though local sales and freezing outlets were also supplied. The cannery at Kinsale purchased regular supplies from sources in the Cork area.

The table hereunder gives details of the quantity, total value and unit price of mackerel take in each of the past ten years:—

TABLE 4.

Year	Cwt.	£	Average value per cwt.
			s. d.
1960 ...	37,125	58,144	31 4
1959 ...	25,645	40,978	31 11
1958 ...	35,490	39,570	22 4
1957 ...	22,913	36,209	31 7
1956 ...	13,850	24,815	35 10
1955 ...	11,563	18,913	32 9
1954 ...	14,766	21,967	29 9
1953 ...	15,374	22,976	29 11
1952 ...	13,018	20,967	32 3
1951 ...	17,017	19,959	23 5

SHELLFISH.—The progressive expansion of shellfish landings achieved over the last decade received a setback in 1960 when the value of the total catch of all varieties fell to £339,625 as compared with £402,716 for 1959. This decrease is attributed in the main to the adverse weather conditions which prevented full-scale regular effort in the different shell fisheries. With the exception of oysters, mussels and periwinkles which showed increases all other varieties declined in quantity and value. The three varieties named are mainly taken in sheltered waters along the shoreline and fishing for them is not so vulnerable to weather conditions as for the other varieties which are found in more open sea.

Demand for all varieties of shellfish was good. However, in the case of Dublin Bay prawns (*Nephrops norvegicus*) taken in the Irish Sea the sales were slow at times because of a noticeable reduction in the average size of prawn as a result of which this fishery was not prosecuted as vigorously and for as long as in the preceding few seasons. Oyster production improved considerably but the average price realised was below that of previous years. Mussels showed an appreciable increase in unit value as well as a satisfactory increase

in quantity; this improvement was mainly due to the progressive development of the canned mussel trade with Great Britain.

Much improvement has been recorded in the past few years in the lobster and crawfish ponding trade and some very modern holding ponds have been erected at various points round the coast. It is hoped that, by reducing the mortality rate in ponds and regulating the flow of these shellfish on to the market, the fishermen's earnings will stand to benefit.

The value of shellfish landings in each of the past ten years was as follows:—

TABLE 5.

Year		£
1960	...	339,625
1959	...	402,716
1958	...	291,255
1957	...	239,968
1956	...	233,634
1955	...	196,103
1954	...	154,525
1953	...	142,554
1952	...	124,196
1951	...	93,604

PERSONNEL AND VESSELS.—The number of men engaged in sea-fishing in 1960 was 5,868 as against 6,173 in the previous year. The drop occurred practically entirely in the "partially engaged" category which fell from 4,402 to 4,104. The number of full-time fishermen remained virtually unchanged at 1,764. The total number of boats engaged in fishing during 1960 was 2,205 as against 2,308 in 1959. The number of vessels of 15 tons gross and over rose from 227 in 1959 to 240 in 1960. Detailed figures are given in Appendix No. 6.

TRAINING OF FISHERMEN.—The two training schemes were continued during the year. Under the scheme for training fishermen as skippers, applicants are required to be not less than twenty years of age and to have at least three years' sea-fishing experience. The six trainees who were attending the Town of Galway Vocational School at the end of 1959 satisfactorily completed their courses and were awarded certificates of competency under the Merchant Shipping Acts. It was disappointing to find that suitable applicants for admission in 1960 numbered only five of whom two subsequently withdrew. Arrangements were made to have the three remaining trainees commence theoretical training at Galway after Easter, 1961, with the next group selected. With a view to encouraging greater participation in this scheme, the conditions of training were improved towards the end of 1960. Higher allowances were authorised and the training period was shortened to a maximum of 28 weeks, i.e., not more than 12 weeks practical training and 16 weeks theoretical training, as compared with 40 weeks previously (20 weeks

practical training and 20 weeks theoretical training). Further courses announced in December, 1960, were scheduled for the spring and summer months for the greater convenience of fishermen.

Under the scheme for training boys as fishermen, applicants are required to be not less than sixteen years of age. Previous sea-fishing is not necessary. Boys are assigned to selected fishing vessels and allowances are payable to them for not more than two years while undergoing training on the vessels. A boy being trained as an engine man, who has made satisfactory progress, will be given further training ashore and his allowance will continue for an additional period of not more than six months. The response to this scheme continued to be fairly satisfactory. In addition to the nine boys undergoing training at the beginning of the year, nineteen others commenced training. Some discontinued, however, and sixteen boys were undergoing training at the end of the year. Two others qualified for employment as deck hands on a share basis and the payment of their allowances under the scheme ceased. A further eighteen boys were selected at interviews held in December, 1960, and arrangements were in hand at the end of the year to place them on suitable boats.

AN BORD IASCAIGH MHARA.—In the year 1959/60 the Board received from Fisheries Vote a grant of £43,250 in aid of administration and grants totalling £93,097 for capital development, including new boats, and general development. Repayable advances made to the Board from the Central Fund amounted to £8,630 for capital works and £181,950 for boats and gear.

The Eighth Annual Report and Accounts of the Board covered the twelve months ended 31st March, 1960. Some of the main features of the Board's activities as recorded in the report and accounts were as follows:—

Sixteen new boats were issued on hire-purchase terms during the year. Issues of boats and gear on hire-purchase, credit or cash sales were valued at £239,501. The number of motor fishing vessels the subject of hire-purchase transactions at 31st March, 1960, was 122, valued at £854,318 at the time of issue. Loans were also made by the Board to a commercial concern associated with the fishing industry in respect of two large fishing vessels.

The quantity of fresh sea fish (excluding shellfish and imported white fish) handled by the Board during the year was 146,423 cwt. valued at £528,102 as compared with 188,430 cwt. valued at £588,040 for the previous year. Auctioning and wholesaling of fish resulted in a loss of £8,683 compared with a profit of £825 in the previous year due to a considerable extent to the loss of auction commission resulting from the granting of permission in December, 1958, to hire purchasers to sell their catches to approved auctioneers other than the Board.

Two of the Board's offshore vessels were laid up for the greater part of the year due to difficulty in procuring suitable crews; the third continued fishing during the year. The total quantity of fish

landed by them was 8,270 cwt. which realised a net figure of £29,104. After providing for administration and other overhead charges, there was a loss of £20,770 for the year as compared with £20,990 for the previous year. Provision of £30,263 for additional depreciation on these vessels was made in the accounts.

The processing stations at Killybegs, Galway and Schull continued to operate far below full capacity as supplies, especially of white fish, at prices which would permit of operating on an economic basis fell considerably short of requirements. There was an operational profit of £1,608 on the three factories. When overhead charges were taken into account, however, a net loss of £17,327 resulted.

The manufacture of ice was continued at Killybegs, Murrisk, Cleggan, Galway, Dingle, Schull, Ballycotton and Dunmore East. An ice plant was also provided at Castletownbere but it had not gone into operation by the end of the year. In order to encourage its use, ice was sold by the Board at the coast at a subsidised price of £4 per ton ; a grant of £6,000 was received from the Exchequer as a subsidy.

SEA FISHERIES PROTECTION.—As from 1st January, 1960, straight baselines from which the territorial seas are measured in certain areas were prescribed by Order of the Government dated 20th October, 1959, and entitled the Maritime Jurisdiction Act, 1959 (Straight Baselines) Order, 1959, (S.I. No. 173 of 1959). In accordance with sections 3 and 6 of the Maritime Jurisdiction Act, 1959 (No. 22 of 1959), the outer limit of the territorial seas is three nautical miles from the baseline and all sea areas within that limit are included in the exclusive fishery limits of the State.

In the protection of the exclusive fishery limits the Naval Service of the Department of Defence carried out regular patrols and, in the course of 1960, arrested five vessels for infringing the limits. Prosecutions were brought in all cases and convictions were secured in three of them, resulting in fines and forfeiture of fish and gear. The Garda Síochána rendered assistance in these proceedings and in the enforcement of fishery regulations generally.

MARINE WORKS.—After consideration of the recommendations of the Swedish consultant, whose report provides a long-term plan for fishery harbour development, it was decided to proceed with the preparatory works for the development of five major fishery harbours —at Killybegs, Castletownbere, Passage East, Howth and Galway— at a cost of some £1,200,000.

Proposals for lesser marine works with a fishery interest were also considered during the year in consultation with other Departments and bodies concerned. The most notable case in which an improvement scheme was commenced was that of Greencastle, Co. Donegal ; the estimated cost was £68,000.

SCIENTIFIC INVESTIGATIONS.—The Department's first exploratory fishing vessel *Cú Feasa*, which was built at Deest, Holland,

arrived in Dublin on 31st March, 1960. Up to the end of 1960 it was principally concerned with herring investigations off the south and east coasts and research work on whiting and Dublin Bay prawns (*Nephrops norvegicus*) in the Irish Sea. A brief account of these studies is given below.

The establishment of a new fisheries research station at Galway was decided upon. Galway will also become a base for the *Cú Feasa* and information assembled by the vessel will be studied there in addition to other scientific and technological work to be undertaken at the research station.

The study of the herring populations off the south coast was continued during 1960. Samples of herrings were taken in the West Cork area with a view to ascertaining what relationship, if any, existed between these fish and the Dunmore East stocks. In this connection, certain meristic characters (i.e., the number of vertebrae to the backbone) were examined. The distribution of juvenile herring in the Dunmore East area was further investigated with systematic sampling of small fish from the sprat weirs at Passage East in Waterford Harbour and at Ballinatray, near Youghal, in the estuary of the Blackwater. In addition, a specially-designed beach seine was operated at a number of shore stations between Ardmore, Co. Waterford, and Carne, Co. Wexford. An investigation into the spawning of herring off Dunmore East was also started in December, 1960, when a "tin-tow net" (a plankton sampling device) was used from the *Cú Feasa* in a search for herring larvae from the mouth of Wexford harbour to the Fastnet. A report on these herring investigations appears in Appendix No. 24.

In the course of the sprat weir, beach seine and "tin-tow net" surveys, other clupeoids (fish of the herring family) such as sprats and pilchards were encountered. These were also examined and records made for future reference.

The investigation of whiting stocks, particularly those of the Irish Sea and, to a lesser degree, from the south and west coasts, was resumed during the year on a more extensive scale. The *Cú Feasa* carried out frequent cruises in assisting in the determination of the ratio of the sexes, the onset of maturity and spawning, and the rate of growth and recruitment. The relationship of the size of whiting caught to the size of mesh used was also investigated. A study of the meristic characters of whiting, the collection of gall bladder parasites and the assembly of information on the occurrence of "black spot" of whiting was initiated in December, 1960, with a view to delimiting the areas covered by the various individual stocks of whiting, particularly in the Irish Sea.

In continuation of work commenced in 1957, 276 lobsters were tagged, tail-punched and released in June, 1960, on the Dalkey (Co. Dublin) fishing grounds. By the end of 1960, 69 of these fish had been recaptured of which 9 had moulted with a consequential increase in size. A high proportion of the local catch was also examined as to size, sex, etc., during the year. The considerable volume of

information that had become available through this study in the growth rate, size for age, sex maturity and other characteristics of Irish lobsters was being processed at the end of 1960.

Constant sampling of stocks of Dublin Bay prawns (*Nephrops norvegicus*) in the Irish Sea was undertaken during the year when experiments aimed at determining the relationship between the size of mesh and of prawns taken and the variation of catch at different times of day were carried out. These experiments indicated that very little loss of prawns resulted from the use of nets with a 70 mm. mesh as compared with smaller mesh nets. A pamphlet outlining the results of these investigations was circulated to Irish fishermen, buyers and other interested parties.

The experiments which were commenced in 1959 into the rehabilitation of mussel beds in Carlingford Lough were continued and the previous year's observations on the improvement of the meat content of the mussels were confirmed. These mussel beds had become largely covered by mud through disuse but part of the area has been cleared by pulling a harrow behind a motor-boat. Experimental transplantation of mussels was carried on in the estuary of Bandon River and subsequent examination of the stocks indicated that, after as little as sixteen weeks, there was a very marked improvement in the quality of the mussels.

In conjunction with An Bord Iascaigh Mhara an experiment was undertaken in July, using a 60 ft. trawler, to explore the possibilities of developing the escallop fishing along the coast of West Cork. The gear used included a heavy duty "Baird" sledge dredge and an Isle of Man dredge. The results were encouraging and suggested that boats of this size might be able to establish a profitable escallop fishery in the area.

The study of the rehabilitation of our oyster fisheries was continued during the year. One of the Assistant Inspectors visited oyster farms in France and Holland. The size distribution of oysters in the Fenit (Tralee) and Clarenbridge (Galway) beds was also investigated.

The reported occurrence in 1960 of rare or scarce fish in Irish waters was greater than in any preceding year. Four specimens of the black mouthed dogfish (*Pristiurus melanostomus*) were identified from catches in the Dingle area. This species was recorded on only two previous occasions from Irish waters. Up to 1960 the great silver smelt (*Argentina silas*) had been recorded from Irish waters on only three occasions, but in 1960, seven specimens were obtained from the Dingle area in February, March, May, July and December. The closely related but smaller and more common species (*A. sphyraena*) was also identified in large numbers from catches in the Dingle area. Eleven specimens of the boar-fish (*Capros aper*) were recorded in 1960—nine from the Dingle area and two from the vicinity of the Coningbeg Lightship. This species had been recorded only four times previously from Irish waters. An exceedingly rare bream, black bream or old wife (*Spondyliosoma cantharus*) which

had been recorded only twice around Ireland, was captured in the Dingle area, and a bonito (*Katsuwonus pelamus*), of which only five previous specimens have been recorded, was captured at Cheekpoint in Waterford Harbour. Two rare blennies, the butterfly blenny (*Blennius ocellaris*) and another without a common name (*Lumpenus lampetraeformis*), were also recorded during the year. Two specimens of the butterfly blenny, previously recorded on five occasions, were also taken by the *Cú Feasa* off the Coningbeg Lightship in November and *L. lampetraeformis*, previously recorded on three occasions, was taken no less than twenty-four times from catches made by the *Cú Feasa* in the Irish Sea. A rare member the gurnard family, the piper (*Trigla lyra*) was recorded seventeen times in 1960 from the coast of Co. Kerry ; the number of previous specimens recorded had not exceeded six.

Of the scarce, as distinct from rare, fish large numbers of the greater fork beard (*Urophycis blennoides*) were taken off Dingle and a report upon them by one of the Assistant Inspectors of Fisheries was accepted for publication in the *Irish Naturalists' Journal*. Fishermen in Dingle also took fairly large numbers of the electric ray (*Torpeda nobiliana*) so that there is evidence that this species may be quite common on some parts of the Irish coast. Fourteen specimens of the red-band or red-snake-fish (*Cepola rubescens*), two specimens of the greater weever (*Trachinus draco*), one sturgeon (*Acipensea sturio*) and one scald fish (*Arnoglossus imperialis*) were recorded during the year. These four species had heretofore been regarded as scarce in Irish waters. A report by the Inspector and Scientific Adviser on the rare and scarce fishes taken in 1960 was accepted for publication by the *Irish Naturalists' Journal*.

INTERNATIONAL AND OTHER CONFERENCES—

(1) International Council for the Exploration of the Sea.—The annual conference of the Council held in Moscow from 18th to 28th September, 1960, was attended by the Inspector and Scientific Adviser of the Fisheries Division. In addition to contributing a paper of his own on rare fishes in Irish waters, the delegate communicated papers prepared by other members of the Department's staff on (i) the Dunmore East herring fishery; (ii) whiting of the Irish Sea; (iii) Dublin Bay prawns and (iv) the movements of salmon from Ardmore, Co. Waterford. He also participated in a symposium on the reading of salmon scales. He was re-elected Chairman of the Consultative Committee, which organises the scientific work of the Council through its various subject committees. In May, 1960, two members of the Inspectorate on the sea fisheries side attended a meeting in London of a sub-committee, set up by the Herring Committee of the Council, to discuss and collate the results of researches on the Dunmore East herring industry ; at this meeting also were British, Dutch and German representatives.

(2) PERMANENT COMMISSION UNDER THE INTERNATIONAL FISHERIES CONVENTION OF 1946.—The eighth meeting of the Commission held in London in May, 1960, was attended by the Assistant Secretary in charge of Fisheries and the Inspector and Scientific Adviser. Arrangements were made at this meeting to set up a special committee to examine further the problems relating to the enforcement of the minimum mesh provisions of the Convention in respect of whiting. This committee met in October, 1960, in London and the Inspector and Scientific Adviser was present. It was decided that scientists from the Lowestoft and Aberdeen fisheries laboratories and others from Belfast and Dublin should meet in Dublin in November, 1960. As the outcome of this further meeting, a programme of research on whiting off the Irish coast and the west coast of Great Britain was formulated.

(3) INTERNATIONAL CONFERENCE ON THE LAW OF THE SEA.—The Inspector and Engineer was a member of the Irish delegation at the Second United Nations Conference on the Law of the Sea held in Geneva in March-April, 1960.

ENGINEERING.—For the purpose of the operations of the new exploratory fishing vessel *Cú Feasa*, suitable grid charts were prepared and various items of special equipment were calibrated.

One of the Assistant Engineers engaged in sea-fishery technological work attended a course in fish handling and processing at Torry Research Station, Aberdeen, in January, 1960, following which he began a study of associated problems here.

TECHNICAL ASSISTANCE.—The report of the Food and Agriculture Organisation of the United Nations on the Irish sea fishing industry, which is based on a study made by a Canadian economist, was published towards the end of the year and comments were invited from associations and persons interested. An officer of the Department completed a training course in the United States in the marketing of fish and fish products under arrangements sponsored by the European Productivity Agency of O.E.E.C. Under the Department's technical assistance programme, officers during the year—

(*a*) attended a course of study of fish handling and processing organised by the British Department of Scientific and Industrial Research at Torry Research Station, Aberdeen ;

(*b*) studied oyster cultivation methods at centres in France and the Netherlands, and

(*c*) further examined eel fishing practices in the Netherlands.

LEGISLATION.—Particulars of statutory instruments made during the year relating to sea fisheries are included in Appendix No. 21.

PART II

INLAND FISHERIES

The total catch of salmon by all methods in 1960 was considerably less than that in 1959 being 1,364,292 lb. valued at £410,779 compared with 1,624,447 lb. valued at £482,527. The catch of sea trout amounted to 61,948 lb. valued at £10,712 compared with 77,723 lb. valued at £12,978 for 1959. The total quantities of salmon and sea trout taken in the years 1958, 1959 and 1960 are given in Appendix No. 10. The catch of salmon and sea trout within the Foyle Area (part of which formerly comprised the Moville Fishery District) is not included in these figures, but is shown separately in the section of the report dealing with the activities of the Foyle Fisheries Commission.

During 1960 conditions were generally unfavourable for netting owing to the high water which prevailed for much of the season. In consequence nets in many estuaries were unable to operate effectively. In some cases continuous high water towards the end of the season also adversely affected angling for salmon and sea trout. Following the trend of a number of years past the peak runs of grilse in most rivers was in the second half of July. This, coupled with poor runs of the larger and earlier running summer fish resulted in reduced catches, both by nets and rods, in late May and for the most of June. The runs of large spring fish also appear to have been poor. In view of the abnormal weather conditions in 1960 it is difficult to estimate precisely the strength of runs of fish into Irish rivers generally. All indications, however, are that the runs of most age groups were below average.

Particulars of the catches of salmon made in each Fishery District for the years 1958, 1959 and 1960 are given in Appendix II. The catch of salmon in 1960 was distributed as to the various methods of capture, as follows:—

Draft nets	51.4%
Drift nets	19.3%
Rod and line	16.9%
Stake nets and other methods ...	12.4%

The proportion of fish taken on rod and line showed a slight increase on that of the previous year, although the actual quantity was less than in 1959. The number of salmon taken on rod and line in 1960 was 27,199 and the weight was 230,423 lb. This catch was valued at £76,475. The average weight of salmon and grilse, landed on rod and line, was 8.4 lb. compared with 8.2 lb. for 1959 and 7.5 lb. for 1958.

A total of 8,742 rod licences was issued in 1960, an increase of 951 over the corresponding figure in 1959. The average catch of salmon by rod and line throughout the country was 3.1 fish weighing 26.4

lb. and valued at £8 14s. 11d. compared with 4.0 fish, weighing 35.4 lb. and valued at £10 8s. 2d. for 1959. The marked reduction in the corresponding figures is attributable to the adverse conditions already mentioned. As in the previous two years the highest average weight for fish taken on rod and line (13.0 lb.) was for the Drogheda District. The lowest average weight (6.5 lb.) was recorded for the Connemara and Ballina districts where the bulk of the catches are always grilse.

The catch of sea trout by all methods showed a decrease from that of the previous year. This is attributable to the fact that the effectiveness of commercial fishing was greatly reduced by high water during the period of peak runs. The rod catch was, however, somewhat better than in the previous two seasons. The sea trout catch was distributed as follows:

Rod and line	69.9%
Draft nets	26.1%
Other commercial methods ...	4.0%

The form in which catch statistics are compiled does not lend itself to expressing the average catch per rod for rods used in fishing for sea trout solely. It may be mentioned, however, that the returns for the Connemara District, one of the leading sea trout districts, show an average of some 21 sea trout weighing 20 lb. landed per rod.

Stormy weather in the months of June and July favoured the open sea drift netting for salmon off the Donegal and Mayo coasts. This fishery depends mainly on grilse. Catches were good at most landing places, despite the fact that runs were below average.

High water conditions made observations on the smolt migration difficult but in those areas where they could be observed the runs were reported to be satisfactory. In general, fish mortality was low during the year and only a small number of cases of pollution came to notice. The incidence of furunculosis was also very low.

Officers of the Department paid visits to fish markets in Great Britain to investigate the quality of Irish salmon, and the information so collected has been used when necessary towards securing improved packing, icing and transport of Irish salmon.

In 1960 the Corporation of Dublin Wholesale Fish Market handled 45,424 salmon and grilse weighing 340,841 lb. compared with 50,936 fish weighing 401,252 lb. in 1959.

BOARDS OF CONSERVATORS.—Details of receipts and expenditure of Boards of Conservators in 1960 are given in Appendix No. 17 of this Report.

EMPLOYMENT IN THE INDUSTRY.—Exclusive of persons employed in the marketing and transport of fish, a total of approximately 4,700 persons found either whole-time or part-time employment in inland fisheries during the year. The figure includes 3,083

persons engaged in netting for salmon under common law right and 843 employed by Boards of Conservators on protection of fisheries over the open and closed seasons, the remainder being employed by proprietors of commercial salmon fisheries, by fishery owners or by angling associations.

INSTRUMENTS OF CAPTURE.—The total number of fishing licences of all kinds issued during the year was 10,059, representing an increase of 894 on the figure for 1959. The totals in recent years were—1959, 9,165; 1958, 11,053; 1957, 10,531; 1956, 10,135; 1955, 9,027; 1954, 8,690.

The numbers of the various classes of licences issued in each fishery district during the year and the rates of licence duty are given in Appendices Nos. 18 and 19 respectively.

SALMON EXPORTS.—The quantity of salmon exported in 1960 was 10,920 cwt. valued at £474,322 as compared with 13,682 cwt. valued at £542,135 in 1959. These figures include landings of salmon in Co. Donegal from waters in the area administered by the Foyle Fisheries Commission. The average export price per cwt. of £43 8s. 9d. obtained in 1960 was higher than the corresponding figure in 1959, which was £39 19s. 9d.

The number of salmon exporters licensed under the Agricultural and Fishery Products (Regulation of Export) Act, 1947 (Export of Salmon) Order, 1954 (S.I. No. 275 of 1954), was 79.

Of the total quantity of salmon exported 9,233 cwt. went to Great Britain and 901 cwt. to France.

DEVELOPMENT OF EEL FISHING.—Following the exclusion of eel fishing engines from the restrictions imposed by the fishery statutes on the erection of new weirs in fresh water, a total of 24 temporary authorisations was issued in 1960 for the erection of new eel fishing engines. Many of these engines had worthwhile catches which were reflected in increased exports, 3,212 cwts. of eels valued at £40,562 being exported in 1960 as compared with 3,086 cwts. valued at £36,975 exported in 1959.

FISH CULTURE.—Details of salmon, sea trout and brown trout ova produced at the various hatcheries are given in Appendix No. 22.

The output of salmon ova in the 1959/60 spawning season amounted to 7,268,000, an increase of more than 3½ millions over that of the previous year. 1,002,000 salmon ova and 107,000 sea trout ova were distributed from the Department's hatchery at Glenties, Co. Donegal, and the State assisted hatchery at Lismore, Co. Waterford, during 1960. The Inland Fisheries Trust Inc. hatched and released into Glenbower Lake, Killeagh, Co. Cork, 50,000 salmon ova and 10,000 sea trout ova.

During 1960, 460,000 brown trout from three months to the fingerling stage and 700,000 unfed fry were stocked in waters controlled by

the Inland Fisheries Trust. Sales by the Trust to angling associations and others accounted for a further 50,000 ova, 30,000 fry, 60,000 three to four months old summerlings and 40,000 fingerlings. The Trust also stripped trout from Lough Corrib and hatched 250,000 ova on behalf of a local association.

Activities directed towards development of rainbow trout included stripping 150,000 ova of the Shasta strain from the Trust's own brood stocks and distribution in selected waters of 23,350 ova of this type. During the year the following quantities of ova were imported —brown trout, 850,000; rainbow trout, 150,000 Shasta strain and a like quantity of Irideus.

For the purpose of demonstrating the feasibility of rearing rainbow trout for food as an adjunct to ordinary farming, two demonstration fish pond units were constructed, one at Tooreen, Glen of Aherlow, Co. Tipperary, and the other at Blackwater, Enniscorthy, Co. Wexford. The Aherlow unit was stocked with 11,000 fry and 2,000 fingerlings and that at Enniscorthy with 15,000 fry. The fish in both units made good progress and all the fingerlings had reached market size and had been sold before the end of the year. A number of inspections was carried out with a view to setting up further units.

Investigations were continued into the availability of suitable and economical sources of food for pond trout. As a result of collaboration between the Inland Fisheries Trust Inc. and Ranks (Ireland) Ltd., a reinforced fish food pellet has been developed. A series of feeding trials is planned to test the value of the new pellet and the tolerance of rainbow trout to it.

REGULATION OF ERNE SALMON FISHERY.—The state of salmon stocks in the Erne system continued to receive attention. Measures designed to permit limited exploitation as far as consistent with the need for restoring adequate spawning stock were discussed early in 1960 with representatives of the Ballyshannon Board of Conservators and the fishermen concerned. The course adopted had some novel features. As in previous years normal fishing by commercial methods was suspended but a count of fish ascending past Cathaleen's Fall dam was maintained with the co-operation of the Electricity Supply Board. By the 29th June the recording apparatus had shown the passage up river of upwards of 3,000 fish—an escapement which, in addition to that during the close season and weekly close time, was deemed to represent reasonable provision towards the long-term restoration of spawning stock. Accordingly, net fishing was permitted by bye-law as from that date until the end of the statutory open fishing season (19th August). The special local licence duty for draft nets was fixed at £25 each having regard to the date on which fishing was declared open.

Catches proved to be quite good in the opening weeks of permitted fishing time and the fishermen generally appeared satisfied with the limited fishing opportunity which had been made available. The

Electricity Supply Board and the net fishermen collaborated most satisfactorily throughout the season with officers of the Fisheries Division in providing material and facilities for the further study of composition and distribution of the salmon stocks in the system.

The suspension of normal fishing in the Erne estuary will continue in each of the years 1961 and 1962 and permitted fishing will be regulated as in 1960.

SCIENTIFIC INVESTIGATIONS.—Since 1948 Ireland has co-operated in the international tagging experiments sponsored by the International Council for the Exploration of the Sea. During 1960, 87 salmon and grilse taken by drift nets at Ardmore, Co. Waterford, were tagged and released. Recoveries numbering 26 (30%) were made mainly from fish taken in the River Blackwater to the west of the tagging station; two recaptures were made in the River Lee, three in the River Bandon and five to the east of the tagging station as far as the River Slaney. A progress report on these taggings was communicated to the Salmon and Trout Committee of the International Council for the Exploration of the Sea at its meeting in Moscow in September, 1960.

Kelts of salmon and sea trout were tagged in the Rivers Ballisodare, Erne, Lee, Owenea and Shannon during 1960. A total of 1,987 salmon and grilse kelts and 109 sea trout kelts were tagged by the staff of the Department and 76 tags from salmon and 9 from sea trout were recovered during the year.

Further material, consisting of sets of salmon and grilse scales with relevant data, was collected from the Rivers Corrib, Erne, Moy and Shannon. At the close of 1960 this material was being studied. The lessee of the fisheries on the Bundorragha River in Co. Mayo also kindly submitted scales and data from salmon and sea trout taken by rod and line in the river in 1960 and by the end of the year the material so collected was being prepared for scientific examination. Collections of scales of brown trout from selected areas were also made during the year.

In May, 1960, investigations were initiated into the effects of the proposed drainage scheme on the River Moy on all aspects of fish life. A number of survey stations was set up on the Bunree River, a tributary of the Moy, both within the area to be drained and outside that area for control purposes. At these stations pre- and post-drainage investigations of the chemical, biological and physical conditions were undertaken during the year. It will be necessary to continue these observations over a number of years.

During the year studies of the age, growth, food and predatory habits of pike from a number of lakes in the west of Ireland, namely Loughs Conn, Caller, Mask and Corrib and from Inchigeelagh lake in the south were undertaken by the Department's staff.

The examination of material collected from the Poulaphouca Reservoir, was continued during the year and a detailed report of the findings was expected to be ready in 1961.

During the year members of the public interested in scientific information about their catches continued to send in sets of scales and relevant data for examination. The Department's scientific staff also identified species and read scales of fishes submitted to the Irish Specimen Fish Committee for expert identification. In connection with the activities of this committee it is noteworthy that some valuable information has been obtained on the growth of brown trout which reach large dimensions. A report upon a large number of specimen brown trout by the committee's chairman was accepted for publication by the *Salmon and Trout Magazine.*

ENGINEERING.—*Hydro-Electric Development*: No new schemes were initiated during the year and work was concentrated on the study of the effects on fish life of the installations already in existence. Investigations into the passage of smolts through turbines were continued in the Lee and Shannon and experiments on balsa wood boxes and fish shapes suggest that smolt mortality due to passage through turbines is less than is commonly believed. The investigation continues. De-oxygenation of the water in the Iniscarra reservoir of the River Lee has been under examination. It is hoped that the oxygen deficiency may be corrected by the installation of air diffusers or other suitable means. Efforts to encourage the movement of fish into the River Clady from which a substantial part of the flow over a long length of the river is diverted for hydro-electric power have not so far proved fully effective. A new programme has been drawn up for 1961. In an effort to rehabilitate the salmon fishing of the Erne system investigations continue into the possibility of employing the part of the salmon stock in the Abbey river, an estuarine tributary of the River Erne, as a source of supply of parent fish for the re-stocking of the main river, and into the potentialities of Lough Knader near Ballyshannon as a rearing area for smolts.

Arterial Drainage:—A number of complaints as to the effects of drainage works completed, or approaching completion, on salmon and trout fisheries in various rivers, including the Feale, Glyde and Dee, and Rye water, and difficulties in the operation of the commercial salmon and eel fisheries in the Corrib were investigated and various means of amelioration were examined and where possible carried out. Work in progress on the Corrib, Maine, Nenagh and Deele (Co. Donegal), was kept under examination and where necessary the Commissioners of Public Works were requested to undertake special works in the fishery interest, including the construction of a fish pass at Tyone weir on the Nenagh river. In the case of the Moy a very close liaison has been maintained with the Office of Public Works to ensure the least possible effect of the drainage operations on the valuable salmon fisheries of that river system.

Salmon River Improvements:—Surveys of a number of obstructions to the movement of salmon were made and designs for fish passes undertaken. In particular drawings and specifications were completed for an extensive fish pass on the River

Inagh, Co. Clare, to enable migratory fish to pass the high rock barrier at the head of the tideway; provision has been included for installation of an electronic fish counter.

Pond Fish Culture and Eel Fishery Development: —Two experimental small-scale fish farm units for the production of rainbow trout were constructed at Aherlow, Co. Tipperary, and Blackwater, Co. Wexford. Advice on special storage accommodation for displaying rainbow trout was also given in response to enquiries. Advice was also given as to the setting up of new eel fishing devices; and information on improved methods for the capture and storage of eels was given to several enquirers.

Salmon Hatchery:—The preparation of plans and specification for a proposed large-scale salmon hatchery and rearing station at Cong, Co. Mayo, had almost reached completion by the end of the year.

Foyle Fisheries Commission and Salmon Research Trust:—Advice on various engineering matters was provided to both these organisations. Design work carried out on their behalf included a fish pass at Largy Green weir for the Foyle Commission. New trapping arrangements, holding ponds, a salmon fry rearing house and rearing ponds designed by, or in accordance with recommendations of, the Department for the Salmon Research Trust were completed during the year.

OFFENCES AGAINST THE FISHERY LAWS.—The number of prosecutions during 1960 was 199 as compared with 248 in 1959. The Garda Síochána continued to co-operate with Boards of Conservators in the protection of inland fisheries throughout the year.

INTERNATIONAL CONFERENCES. — EUROPEAN INLAND FISHERIES ADVISORY COMMISSION: This Commission, which was established under the auspices of the Food and Agriculture Organisation of the United Nations held its inaugural meeting in Dublin during the period 25-30th April, 1960, at the invitation of the Government. Representatives from 15 countries attended the meeting. The objectives of the commission are to promote improvements in inland fisheries and to arrange for exchange of information and advice between member Governments. Mr. M. J. Gallagher, former Assistant Secretary in charge of the Fisheries Division, was selected as first chairman of the commission.

FOYLE FISHERIES COMMISSION.—Following the making of new licensing regulations in January, 1960, a limitation was imposed on the number of draft net licences issued for the River Foyle and drift net licences for Lough Foyle. This move resulted in more orderly fishing conditions on the river.

The total net catch for the season was slightly above the average for the previous seven years while the quality of the fish was well up to standard. Angling conditions were reasonably good during

the season in spite of heavy rainfall. The catches by nets and rods were as follows:—

	Salmon & Grilse		Sea Trout		Total	
	No.	Weight lb.	No.	Weight lb.	No.	Weight lb.
Nets ...	75,016	535,390	2,066	3,235	77,082	538,625
Rods ...	1,500	11,446	554	554	2,054	12,000
Total ...	76,516	546,836	2,620	3,789	79,136	550,625

Investigations into the stocks of spawning salmon in the Finn system initiated in the 1958/59 season were continued. In addition, the Commission provided bursaries which enabled a survey of the fauna of the Finn basin to be undertaken by students under the direction of Dr. Carmel Humphries, Professor of Zoology, University College, Dublin. The survey commenced in July, 1960, and was expected to take about a year to complete.

Tagging of salmon and kelts and investigation of late running fish were continued as part of the Commission's programme for study of the stocks of the district. A total of 311,000 salmon fry was distributed and improvement works were carried out on the Rivers Mourne, Finn and Roe. During the year 104 prosecutions were instituted, 96 of them resulting in convictions.

With the approval of the Minister for Lands, Dublin, and the Ministry of Commerce, Belfast, the Commission made the following regulations :—Foyle area (Rivers Faughan and Roe Angling) Regulations, 1959; Foyle area (Licensing of Fishing Engines) Regulations, 1960.

The Commission's activities are reviewed in their annual report for the period ended 30th September, 1960.

INLAND FISHERIES TRUST, INCORPORATED.—Development of game fishing, coarse fishing and sea angling resources continued as part of the scheme to attract tourists. Stocking of selected waters with fry and fingerlings of salmon, sea trout, brown trout and rainbow trout was again carried out and brood stocks of adult tench, bream and rudd were planted in areas suitable for development as coarse fishing centres. Predator removal was proceeded with and amenities such as fishing platforms and stiles were provided. Surveys were carried out of the coarse fishing potentialities of different areas with a view to advising local groups interested in developing the fisheries.

On the sea angling side five major surveys were carried out, one into the shore fishing potentialities of the south-west coast from Ballycotton to Tralee and four offshore surveys at Rosslare, Dungarvan, Rosscarbery—Clonakilty and Dingle. Assistance was given in the formation of clubs in centres with a good angling potential and advice was given in the preparation of brochures and the running of competitions and festivals.

Film shows on the angling attractions of this country were arranged in Great Britain and material for a further film was compiled. As an additional means of gaining publicity reports were sent regularly to sporting publications abroad. Contact was made with angling clubs in the Six Counties. A sea angling guide, a guide to salmon and sea trout angling and a brochure on brown trout fishing were compiled.

Production of rainbow trout for table use was continued at the fish farm at Fanure, Roscrea, in addition to the production of fry, fingerlings and adult fish for restocking.

The Grant-in-aid to the Trust provided out of the Fisheries Vote was £30,000 while Bord Fáilte Éireann contributed £25,270.

SALMON RESEARCH TRUST OF IRELAND, INCORPORATED. —The report of the Salmon Research Trust for the year ended 31st December, 1960, contains full details of the activities of the Trust for the year. A new hatchery with a capacity of 250,000 and a rearing house with a capacity of 100,000 were completed in time for the reception of ova in 1960. Traps for ascending and descending fish were in operation at the Furnace station during the year and a large amount of data was collected in relation to the conditions under which salmon and sea trout migrate. Tagging of kelts of salmon and sea trout, salmon and sea trout smolts and brown trout was carried out at the Furnace traps and also in Lough Furnace. Numerous tagged fish were recaptured and details are given in the Trust's annual report. Further progress was made in the study of fish predators and a study of the efficiency of different types of smolt tags was initiated.

Two science students from Trinity College, Dublin, made on behalf of the Trust a preliminary biological survey of the Glenamong River, a small stream flowing into Lough Feeagh.

LEGISLATION.—Particulars of the Statutory Instruments relating to inland fisheries made during the year are included in Appendix No. 21.

MICHEÁL Ó MÓRÁIN,
Minister for Lands.

19TH SEPTEMBER, 1961.

APPENDICES TO THE REPORT ON SEA AND INLAND FISHERIES FOR THE YEAR 1960.

Appendices 10 to 16 are compiled from returns furnished by licence holders in pursuance of the Statistics (Salmon, Sea Trout and Eels) (No. 2) Order, 1945.

APPENDIX No. I

Quantity and value of Sea Fish (excluding salmon) returned as landed in 1960

KINDS OF FISH	EAST COAST (Omeath to Carnsore Point)		SOUTH COAST (Carnsore Point to Loop Head)		WEST COAST (Loop Head to Erris Head)		NORTH COAST (Erris Head to Moville)		TOTAL	
	cwt.	£	cwt.	£	cwt.	£	cwt.	£	cwt.	£
Brill	115	1,132	848	8,205	358	2,804	341	3,378	1,662	15,519
Cod	12,691	75,555	8,587	41,692	300	1,815	4,991	23,784	26,569	142,846
Conger Eel	96	375	409	1,212	—	—	32	84	537	1,671
Haddock	1,421	7,196	7,652	36,552	188	1,128	11,084	32,792	20,345	77,668
Hake	1,038	9,086	400	2,773	69	357	237	1,087	1,744	13,303
Ling	61	237	235	906	9	27	188	580	493	1,750
Plaice	10,793	85,922	5,070	44,611	901	8,418	4,169	31,288	20,933	170,239
Ray or Skate	9,897	30,884	9,275	32,602	2,165	7,642	4,172	13,427	25,509	84,555
Soles	503	9,573	1,879	25,358	187	2,318	378	4,893	2,947	42,142
Turbot	317	3,237	562	5,972	197	1,975	274	2,462	1,350	13,646
Whiting	54,661	79,942	28,837	57,920	5,886	17,391	18,272	31,173	107,656	186,426
Other Kinds	3,287	10,317	11,138	36,484	4,109	8,171	5,506	14,091	24,040	69,063
TOTAL DEMERSAL	94,880	313,456	74,892	294,287	14,369	52,046	49,644	159,039	233,785	818,828
Herrings	17,651	9,128	298,695	291,020	26,887	22,026	74,181	72,771	417,414	394,945
Mackerel	143	245	32,997	50,260	1,908	4,430	2,077	3,209	37,125	58,144
Sprats	—	—	97	63	—	—	—	—	97	63
TOTAL PELAGIC	17,794	9,373	331,789	341,343	28,795	26,456	76,258	75,980	454,636	453,152
TOTAL WET FISH	112,674	322,829	406,681	635,630	43,164	78,502	125,902	235,019	688,421	1,271,980
	No.		No.		No.		No.		No.	
Crabs	7,164	144	2,340	44	—	—	24,427	563	33,931	751
Crawfish	510	297	138,673	65,450	53,478	21,522	9,276	5,985	201,937	93,254
Escallops	1,560	55	128,341	3,076	308,810	3,899	—	—	438,711	7,030
Lobsters	61,818	17,337	182,405	50,237	101,877	26,088	126,266	37,323	472,366	130,985
Oysters	—	—	693,000	5,500	511,248	6,277	—	—	1,204,248	11,777
	cwt.		cwt.		cwt.		cwt.		cwt.	
Dublin Bay Prawns	7,720	28,166	—	—	59	141	46	130	7,825	28,437
Mussels	16,426	6,982	23,624	9,566	—	—	—	—	40,050	16,548
Periwinkles	2,245	2,181	12,695	12,464	21,167	27,752	6,988	8,162	43,095	50,559
Other Shellfish	—	—	861	284	—	—	—	—	861	284
TOTAL VALUE SHELLFISH	—	55,162	—	146,621	—	85,679	—	52,163	—	339,625
TOTAL VALUE ALL FISH	—	377,991	—	782,251	—	164,181	—	287.182	—	1,611,605

APPENDIX No. 2

Comparison of the Average Prices per cwt. of various kinds of Sea Fish for the years 1953-1960

	1953	1954	1955	1956	1957	1958	1959	1960
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Brill	9 7 10	8 9 10	8 15 3	9 11 4	9 14 11	8 0 0	9 9 7	9 6 9
Cod	4 11 4	5 1 4	4 14 0	4 12 6	4 5 6	4 14 0	5 9 11	5 7 6
Conger Eel ..	1 3 2	1 11 0	1 15 5	2 1 2	2 2 11	2 4 11	2 6 0	3 2 3
Haddock ..	2 2 2	2 8 5	2 0 2	2 5 5	2 2 0	2 17 1	3 5 5	3 16 3
Hake	2 18 0	3 18 3	4 17 6	5 17 11	4 17 0	6 9 7	6 19 7	7 12 7
Ling	3 16 4	3 10 7	2 10 5	2 10 11	2 7 10	2 8 0	2 18 0	3 11 0
Plaice ..	5 8 9	7 11 2	7 3 7	7 2 3	7 8 9	8 3 6	8 8 8	8 2 8
Ray or Skate ..	2 12 5	2 12 11	2 8 8	2 9 3	2 6 7	2 15 3	3 15 5	3 6 4
Soles	9 12 6	11 5 5	11 5 0	12 11 4	15 6 7	14 5 10	14 14 5	14 4 2
Turbot ..	9 7 1	8 9 0	7 18 9	9 15 3	9 2 0	10 7 1	9 16 2	10 2 2
Whiting ..	1 14 0	1 12 8	1 12 0	1 9 2	1 3 4	1 5 3	1 9 4	1 14 8
Herrings ..	1 3 9	1 1 4	0 15 3	0 14 9	0 14 10	1 1 3	1 3 8	0 18 11
Mackerel ..	1 9 11	1 9 9	1 12 9	1 15 10	1 11 7	1 2 4	1 11 11	1 11 4
Sprats ..	0 8 0	0 3 6	0 4 2	0 10 0	0 5 6	0 6 8	0 7 8	0 13 0

N.B.—" Average price " as shown in this table represents total value divided by total weight for each kind of fish, year by year. It does not purport to take direct cognizance of any abnormal rise or fall in price attributable to a seasonal glut or shortage of a particular kind of fish.

APPENDIX No. 3

IMPORTS AND EXPORTS OF FISH AND FISHERY PRODUCTS IN 1960

(as compared with 1959)

	Quantity		Value	
	1960	1959	1960	1959
I.—IMPORTS	cwt.	cwt.	£	£
Fish, fresh, chilled or frozen	21,901	12,106	104,889	80,416
Fish, cured—not in airtight containers	29,144	26,819	182,401	164,343
Fish and fish preparations in airtight containers ..	21,903	19,846	426,625	366,102
Other fish and fish preparations	6,163	3,894	52,290	32,258
TOTALS	79,111	62,665	766,205	643,119
II.—EXPORTS				
Fish, fresh, chilled or frozen :				
Salmon	10,920	13,682	474,322	547,135
Herrings	270,463	177,089	447,189	334,511
Fresh water eels ..	3,212	3,086	40,562	36,975
Other fish	19,753	22,253	52,783	41,219
Fish dried, salted or smoked not in airtight containers	54,164	57,687	160,260	155,962
Shell fish, fresh, chilled, frozen, salted, dried ..	77,477	76,581	408,905	426,704
Other fish and fish preparations	4,931	5,390	55,123	83,066
TOTALS	440,920	355,768	1,639,144	1,625,572

The figures given above for exports of salmon and trout include those relating to exports from the former Moville Fishery District now comprised in the Foyle Area.

APPENDIX No. 4

HERRING FISHING, 1960

County	Ports at which more than 500 cwt. were landed	Total Quantity cwts.	Value £
Louth	Clogherhead, Greenore and Carlingford ..	13,076	5,635
Dublin	Skerries, Howth ..	3,775	2,482
Wicklow	—	200	316
Wexford	—	1,551	1,324
Waterford	Dunmore East, Passage East	292,369	280,409
Cork	Ballycotton, Kilcrohane, Schull	5,133	8,734
Kerry	—	738	1,293
Clare	—	130	173
Galway	—	453	634
Mayo	Westport, Keel and Keem	26,380	21,331
Sligo	—	99	265
Donegal	Burton Port, Killybegs, Kincasslagh, Bunbeg, Port and Inver, Portnoo and Rossbeg, Teelin, Downings ..	73,510	72,349
	TOTALS ..	417,414	394,945

APPENDIX No. 5

MACKEREL FISHING, 1960

County	Ports at which more than 250 cwts. were landed	Total Quantity cwts.	Value £
Louth	——	35	53
Dublin	——	48	72
Wicklow	——	52	96
Wexford	——	477	1,615
Waterford	Dunmore East, Passage East, Tramore ..	3,598	6,505
Cork	Baltimore, Schull, Castletownbere Union Hall, Ballycotton, Kinsale ..	23,480	34,229
Kerry	Fenit, Dingle, Ballinagall, Brandon ..	6,054	9,664
Clare	——	404	847
Galway	——	749	1,523
Mayo	Louisburgh	640	1,195
Sligo	——	205	315
Donegal	Portacloy	1,383	2,030
	TOTALS	37,125	58,144

APPENDIX No. 6

REGIONAL DISTRIBUTION AND CLASSIFICATION OF FISHING CRAFT AND OF PERSONNEL ENGAGED IN FISHING IN 1960

HOW ENGAGED (i.e whether solely or partially)	MEN	MOTOR VESSELS						SAIL BOATS						ROW BOATS		TOTAL VESSELS
		1st Class			2nd Class		3rd Class	1st Class			2nd Class		3rd Class	Unclassed A	Unclassed B	
		25 tons gross and over	20 tons gross and over but less than 25 tons	15 tons gross and over but less than 20 tons	10 tons gross and over but less than 15 tons and of 18' keel and upwards	Under 10 tons and of 18 feet keel and upwards.	Less than 18 feet keel	15 tons net and over	20 tons net and over but less than 25 tons	15 tons net and over, but less than 20 tons	10 tons net and over but less than 15 tons and of 18 feet keel and upwards	Under 10 tons and of 18 feet keel and upwards.	Less than 18' keel	Open boats of 18' keel and upwards and canoes of 18' or more over all	Open boats of less than 18' keel and canoes of less than 18' over all	
EAST COAST																
Solely engaged ..	417	67	6	3	8	9	—	—	—	—	—	—	—	45	3	141
Partially engaged ..	361	—	—	—	6	17	—	—	—	—	2	4	1	55	8	93
Laid-up	—	9	1	2	3	5	—	—	—	—	2	5	2	6	—	35
TOTALS	778	76	7	5	17	31	—	—	—	—	4	9	3	106	11	269
SOUTH COAST																
Solely engaged ..	741	79	13	16	43	97	2	—	—	—	—	36	39	146	77	548
Partially engaged ..	1,005	—	—	—	5	40	4	—	—	—	1	15	20	63	26	174
Laid-up	—	1	—	1	1	8	—	—	—	—	—	—	—	—	—	11
TOTALS	1,746	80	13	17	49	145	6	—	—	—	1	51	59	209	103	733
WEST COAST																
Solely engaged ..	213	11	4	2	3	40	—	—	—	—	2	34	3	116	69	284
Partially engaged ..	1,426	—	—	4	—	27	—	—	—	—	—	27	15	122	168	363
Laid-up	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1
TOTALS	1,639	11	4	6	3	68	—	—	—	—	2	61	18	238	237	648
NORTH COAST																
Solely engaged ..	393	32	4	3	3	87	—	—	—	—	6	53	—	113	24	325
Partially engaged ..	1,312	—	—	—	1	32	2	—	—	—	6	65	6	68	46	226
Laid-up	—	1	2	—	—	1	—	—	—	—	—	—	—	—	—	4
TOTALS	1,705	33	6	3	4	120	2	—	—	—	12	118	6	181	70	555
TOTALS FOR 1960																
Solely engaged ..	1,764	189	27	24	57	233	2	—	—	—	8	123	42	420	173	1,298
Partially engaged ..	4,104	—	—	4	12	116	6	—	—	—	9	111	42	308	248	856
Laid-up	—	11	3	3	4	15	—	—	—	—	2	5	2	6	—	51
TOTALS	5,868	200	30	31	73	364	8	—	—	—	19	239	86	734	421	2,205

APPENDIX No. 7

TRAWLING AND SEINING, 1960

Port or Locality	Number of men engaged	Number of boats engaged	Tonnage of Motor Boats			Fishing Period
			Not exceeding 10 tons	Over 10 tons	Over 15 tons	
Clogherhead ..	50	9	—	—	9	All year
Balbriggan ..	48	10	—	—	10	All year.
Skerries	44	10	—	1	9	All year.
Howth	85	14	—	—	14	All year.
Dublin	5	2	2	—	—	All year.
Dun Laoire ..	15	5	1	1	3	All year.
Arklow	100	22	—	2	20	All year.
Courtown Harbour	3	1	—	1	—	June to September.
Wexford ..	30	8	2	2	4	All year.
Rosslare Harbour ..	6	2	—	—	2	All year (1 boat) January to October (1 boat)
Kilmore Quay ..	40	13	—	3	10	All year.
Bannow	3	1	1	—	—	Winter months
Fethard-on-Sea ..	4	1	—	—	1	May to December
Duncannon ..	6	2	1	—	1	All year.
Passage East ..	16	7	5	—	2	March to September
Dunmore East ..	60	11	—	—	11	All year.
Ballycotton ..	25	11	10	—	1	All year.
Youghal ..	12	6	6	—	—	July to December
Cobh	10	5	5	—	—	All year.
Union Hall ..	40	10	—	—	10	All year.
Schull	30	7	—	—	6	All year.
Bantry	6	2	2	—	—	November and December.
Castletownbere ..	40	9	—	—	9	All year.
Portmagee ..	20	6	—	—	6	Winter months
Cahirciveen ..	10	2	—	—	2	January to June November to December.
Dingle	50	14	—	4	10	All year.
Fenit	6	1	1	—	—	May to September.
Eyeries (Ballydonegan)	6	1	1	—	—	April to August.
Liscannor ..	3	1	1	—	—	All year.
Galway and Islands	20	10	—	—	6	All year.
Roundstone ..	4	1	1	—	—	Spring and Autumn.
Cleggan and Inishboffin ..	20	5	3	2	—	All year.
Murrisk	5	1	—	—	1	All year.
Achill and Keel and Keem ..	30	6	—	4	2	All year.
Blacksod	5	1	—	—	1	Spring and Winter.
Enniscrone ..	6	2	2	—	—	Spring, Summer and Autumn.
Killybegs ..	24	23	—	—	23	All year.
Burtonport ..	30	6	—	—	6	All year.
Kincasslagh ..	4	1	—	—	1	All year.
Downings ..	4	1	—	—	1	All year.
Buncrana	10	2	—	—	2	All year.
Glengad	35	7	7	—	—	All year.
Greencastle ..	36	9	6	1	2	All year.
TOTALS ..	1,006	292	57	21	185	

APPENDIX No. 8

STATEMENT OF ACCOUNT

in respect of

Repayable Advances for the provision of boats and gear to fishermen made during the period of twenty-nine years to 31st March, 1960, to the Irish Sea Fisheries Association, Ltd., to the date of the Association's dissolution, 23rd April, 1952, and to An Bord Iascaigh Mhara, as from that date.

	£		£
Repayable with Interest on an annuity basis in respect of :—		Repayments to 31st March, 1959	375,530
(*a*) Advances amounting to £1,049,977 made up to 31st March, 1959	1,661,577	Repayments made during year ended 31st March, 1960 ..	63,077
(*b*) Advances amounting to £181,950 made during year ended 31st March, 1960	313,785	Balance outstanding :—	
		Due in arrear £150,028	
		Instalments and interest not matured £1,386,727	
			1,536,755
	£1,975,362		£1,975,362

NOTE.—Advances made to the Association and the Board are repayable on the basis of a twenty year annuity in half-yearly instalments.

APPENDIX No. 9

COASTAL EXTENT OF FISHERY DISTRICTS AND NAMES OF THE PRINCIPAL RIVERS IN EACH DISTRICT

District	Coastal Extent of District	Principal Rivers
No. 1 Dublin	Most easterly point on Red Island, Skerries, to Wicklow Head.	Liffey Vartry.
No. 2 Wexford	Wicklow Head to Kiln Bay, east of Bannow Bay, Co. Wexford.	Slaney Avoca.
No. 3 Waterford	Kiln Bay, east of Bannow Bay, to Helvick Head, Co. Waterford.	Suir Barrow Nore.
No. 4 Lismore	Helvick Head to Ballycotton Pier, Co. Cork.	Blackwater, Funshion, Bride, Awbeg.
No. 5 Cork	Ballycotton Pier to Crow Head, Co. Cork.	Lee, Owenboy, Bandon, Argideen, Ilen, Mealagh, Owvane, Coomhola, Glengarriff, Adrigole.
No. 7 Kerry	Crow Head, Co. Cork, to Kerry Head, Co. Kerry.	Roughty, Sheen, Finnihy, Blackwater, Sneem, Laune, Flesk, Maine, Caragh, Currane, Cummeragh, Inny.
No. 8 Limerick	Kerry Head, Co. Kerry, to Hag's Head, Co. Clare.	Shannon, Deel, Fergus, Mulcair, Little and Upper Brosna, Inny, Maigue, Feale.
No. 9[1] Galway	Hag's Head to the sea point of the boundary between the townlands of Keeraunagark Sth. and Banraghbaun Sth., Co. Galway.	Corrib, Claregalway.
No. 9[2] Connemara	The sea point of the boundary between the townlands of Keeraunagark South and Banraghbaun South, Co. Galway, to Slyne Head, Co. Galway.	Ballinahinch, Recess, Cashla, Owengowla, Invermore, Inverbeg, Screebe, Furnace.
No. 10[1] Ballinakill	Slyne Head to Pigeon Point, Westport Bay, Co. Mayo.	Culfin, Errif, Bundorragha, Dawros, Carrowniskey, Bunowen (Louisburgh).
No. 10[2] Bangor	Pigeon Point to Benwee Head, Co. Mayo.	Newport, Burrishoole, Owenduff, Owengarve, Owenmore, Glenamoy.
No. 11 Ballina	Benwee Head to Coonamore Point, Co. Sligo.	Moy, Cloonaghmore (Palmerston), Easkey.

District	Coastal Extent of District	Principal Rivers
No. 12 Sligo	Coonamore Point to Carrickgarve, Co. Sligo.	Ballisodare, Garavogue (Sligo), Bonet, Drumcliff.
No. 13 Ballyshannon	Carrickgarve to Rossan Point, Co. Donegal.	Erne, Bundrowes, Bunduff, Eske, Eaney Water, Oily, Glen.
No. 14[1] Letterkenny	Rossan Point to Malin Head, Co. Donegal.	Owenea, Gweebarra, Gweedore (Crolly), Clady, Lackagh, Lennon, Crana.
No. 17[2] Dundalk	Carlingford Lough to Clogherhead, Co. Louth.	Fane, Dee, Glyde.
No. 17[1] Drogheda	Clogherhead to the most easterly point on Red Island, Skerries, Co. Dublin.	Boyne, Blackwater, Deel.

Note—The area comprised in the former No. 14[2] or Moville District was, by the Foyle Fisheries Act, 1952, incorporated in the Foyle Area which is administered by the Foyle Fisheries Commission.

APPENDIX No. 10

Quantity and Value of all Salmon and Sea Trout taken in 1958, 1959 and 1960 by Instruments of Capture.

SALMON

Instruments	1960	1959	1958	1960	1959	1958
Total for all engines	lb. 1,364,292	lb. 1,624,447	lb. 1,653,972	£ 410,779	£ 482,527	£ 449,732
Total for rod and line	230,423	259,912	375,452	76,475	77,204	102,089
Total for drift nets	263,521	352,505	286,137	70,672	104,708	77,804
Total for draft nets	701,186	865,830	772,405	210,580	257,187	210,025
Total for stake nets, weirs, etc.	169,162	146,200	219,978	53,052	43,428	59,814

SEA TROUT

Instruments	1960	1959	1958	1960	1959	1958
Total for all engines	lb. 61,948	lb. 77,723	lb. 66,404	£ 10,712	£ 12,978	£ 10,529
Total for rod and line	43,363	41,504	40,308	3,701	6,930	6,391
Total for drift nets	1,263	5,631	1,402	250	875	222
Total for draft nets	16,244	24,483	23,573	3,505	4,088	3,738
Total for stake nets, weirs, etc.	1,098	6,105	1,121	256	1,085	178

This Appendix does not include returns from the former Moville Fishery District.

APPENDIX No. 11

Quantity and Value of Salmon taken in 1958, 1959 and 1960, by Fishery Districts.

Fishery District	*	Quantity			Value		
		1960 lb.	1959 lb.	1958 lb.	1960 £	1959 £	1958 £
Dublin	R	4,935	4,451	5,417	2,019	1,593	1,756
	N	5,455	8,595	2,739	1,837	2,758	768
Wexford	R	19,060	35,089	19,771	6,630	10,713	6,308
	N	25,145	36,463	33,335	10,028	12,067	11,802
Waterford	R	32,690	36,891	47,046	10,854	10,636	12,710
	N	138,314	168,943	140,436	39,256	43,014	30,374
Lismore	R	23,501	33,047	46,231	8,249	9,119	12,533
	N	117,086	135,215	131,133	35,836	46,530	32,597
Cork	R	14,737	21,119	26,573	5,159	6,413	8,370
	N	30,664	79,530	64,896	8,974	23,186	17,452
Kerry	R	27,862	30,040	38,947	8,241	8,584	10,714
	N	93,596	131,060	134,531	25,477	36,106	29,775
Limerick	R	35,973	44,751	84,216	11,902	13,297	24,105
	N	131,903	155,595	144,844	43,297	50,438	44,195
Galway	R	674	1,102	4,286	206	324	1,210
	N	42,275	43,148	31,789	14,402	12,816	9,400
Connemara	R	2,274	2,395	5,340	652	624	1,411
	N	Nil	Nil	Nil	Nil	Nil	Nil
Ballinakill	R	3,347	2,808	6,232	994	843	1,977
	N	14,310	16,459	19,095	3,003	3,384	4,150
Bangor	R	4,196	6,175	7,428	1,249	1,802	2,098
	N	56,422	57,736	80,073	15,194	12,228	16,859
Ballina	R	18,545	24,795	32,051	5,560	6,757	8,157
	N	195,173	247,282	216,223	57,800	89,003	66,051
Sligo	R	5,140	5,106	5,750	1,642	1,600	1,689
	N	39,402	21,587	30,736	9,625	5,181	7,674
Ballyshannon	R	4,436	2,523	4,566	1,507	768	1,329
	N	61,129	57,492	89,865	16,467	13,122	23,305
Letterkenny	R	14,349	11,812	23,617	4,072	3,128	5,989
	N	110,728	94,253	87,089	26,085	21,943	22,405
Dundalk	R	2,639	776	2,671	830	209	736
	N	24,358	29,080	24,195	7,349	7,450	6,083
Drogheda	R	16,065	13,093	12,241	6,709	4,696	4,051
	N	47,909	66,036	50,558	19,674	22,195	21,699
TOTALS		1,364,292	1,624,447	1,653,972	410,779	482,527	449,732

* R. indicates capture by means of single rod and line ; N by means of nets, weirs, etc.

APPENDIX No. 12

Quantity and Value of Sea Trout taken in 1958, 1959 and 1960, by Fishery Districts.

Fishery District	*	Quantity			Value		
		1960 lb.	1959 lb.	1958 lb.	1960 £	1959 £	1958 £
Dublin	R	1,244	2,040	1,497	206	291	227
	N	3,475	7,777	8,047	762	1,727	1,657
Wexford	R	1,421	1,600	878	214	222	129
	N	3,458	5,776	5,384	591	892	813
Waterford	R	963	805	883	142	117	125
	N	249	326	109	54	51	16
Lismore	R	642	322	715	51	49	102
	N	929	2,089	1,482	129	307	249
Cork	R	3,487	5,416	3,853	527	784	558
	N	178	995	1,139	27	131	184
Kerry	R	9,240	6,600	8,307	1,372	952	1,198
	N	1,397	4,507	4,384	293	836	747
Limerick	R	3,592	1,955	1,455	548	304	213
	N	5,300	6,837	3,408	1,489	1,473	632
Galway	R	574	352	879	109	55	154
	N	501	733	533	85	147	106
Connemara	R	8,275	7,431	6,050	1,328	1,186	822
	N	Nil	Nil	Nil	Nil	Nil	Nil
Ballinakill	R	2,281	2,254	4,098	380	378	667
	N	715	1,093	820	106	155	95
Bangor	R	3,406	3,016	3,977	517	449	551
	N	556	1,269	517	106	211	77
Ballina	R	2,068	1,737	823	325	261	108
	N	96	16	144	12	4	20
Sligo	R	274	106	207	48	16	31
	N	Nil	191	36	Nil	29	7
Ballyshannon	R	692	653	459	106	94	49
	N	272	1,402	74	36	175	11
Letterkenny	R	3,214	2,435	3,169	458	352	418
	N	240	462	684	39	69	112
Dundalk	R	579	866	165	101	145	60
	N	352	1,359	306	63	246	44
Drogheda	R	1,411	3,950	1,160	269	641	179
	N	867	1,353	762	219	229	168
TOTALS		61,948	77,723	66,404	10,712	12,978	10,529

*R. indicates capture by means of single rod and line ;
N. by means of nets, weirs, etc.

APPENDIX No. 13

Quantity and Value of Eels taken in 1958, 1959 and 1960 by Fishery Districts.

Fishery District	Quantity			Value		
	1960 lb.	1959 lb.	1958 lb.	1960 £	1959 £	1958 £
Wexford ..	1,864	Nil	Nil	176	Nil	Nil
Waterford ..	38,266	9,101	Nil	4,566	788	Nil
Cork ..	Nil	1,700	Nil	Nil	85	Nil
Limerick ..	58,568	65,520	59,947	9,792	8,567	7,646
Galway ..	67,677	63,201	58,735	9,123	6,666	7,384
Bangor ..	Nil	232	Nil	Nil	18	Nil
Ballina ..	36,340	16,245	8,965	3,770	1,546	716
Sligo ..	4,364	2,920	1,351	500	285	106
Ballyshannon ..	6,699	8,059	2,050	709	923	235
Dundalk ..	3,534	3,858	8,922	399	426	566
Drogheda ..	15,975	8,478	10,633	1,884	742	1,416
TOTALS ..	233,287	179,314	150,603	30,919	20,046	18,069

NOTE :—Figures as above are based on returns as furnished, which are not complete. A total of 358,848 lb. valued at £40,562 was exported during 1960.

APPENDIX No. 14

Total Quantity and Value of Salmon, Sea Trout and Eels taken by all engines in 1958, 1959 and 1960, by Fishery Districts.

Fishery District	Total Weight for District			Total Value for District		
	1960 lb.	1959 lb.	1958 lb.	1960 £	1959 £	1958 £
Dublin ..	15,109	22,863	17,700	4,824	6,369	4,408
Wexford ..	50,948	78,928	59,368	17,639	23,894	19,052
Waterford ..	210,482	216,066	188,474	54,872	54,606	43,225
Lismore ..	142,158	170,673	179,561	44,265	56,005	45,481
Cork ..	49,066	108,760	96,461	14,687	30,599	26,564
Kerry ..	132,095	172,207	186,169	35,383	46,478	42,434
Limerick ..	235,336	274,658	293,870	67,028	74,079	76,791
Galway ..	111,701	108,536	96,222	23,925	20,008	18,254
Connemara ..	10,549	9,826	11,390	1,980	1,810	2,233
Ballinakill ..	20,653	22,614	30,245	4,483	4,760	6,889
Bangor ..	64 580	68,428	91,995	17,066	14,708	19,585
Ballina ..	252,222	290,075	258,206	67,467	97,571	75,052
Sligo ..	49,180	29,910	38,080	11,815	7,111	9,507
Ballyshannon ..	73,228	70,129	97,014	18,825	15,082	24,929
Letterkenny ..	128,531	108,962	114,559	30,654	25,492	28,924
Dundalk ..	31,462	35,939	36,249	8,742	8,476	7,489
Drogheda ..	82,227	92,910	75,406	28,755	28,503	27,513
TOTALS ..	1,659,527	1,881,484	1,870,979	452,410	515,551	478,330

APPENDIX No. 15

Number, Quantity and Value of Salmon taken by Single Rod and Line in 1958, 1959 and 1960, by Fishery Districts.

Fishery District	No. of Fish			Quantity			Value		
	1960	1959	1958	1960	1959	1958	1960	1959	1958
				lb.	lb.	lb.	£	£	£
Dublin ..	529	471	697	4,935	4,451	5,417	2,019	1,593	1,956
Wexford ..	1,813	3,615	1,963	19,060	35,089	19,771	6,630	10,713	6,308
Waterford ..	3,805	4,048	6,581	32,690	36,891	47,046	10,854	10,636	12,710
Lismore ..	2,522	3,528	5,511	23,501	33,047	46,231	8,249	9,119	12,533
Cork ..	1,623	2,701	3,507	14,737	21,119	26,573	5,159	6,413	8,370
Kerry ..	3,761	3,730	5,587	27,862	30,040	38,947	8,241	8,584	10,714
Limerick ..	4,368	5,095	11,135	35,973	44,751	84,216	11,902	13,297	24,105
Galway ..	85	141	777	674	1,102	4,286	206	324	1,210
Connemara ..	337	408	893	2,274	2,395	5,340	652	624	1,411
Ballinakill ..	452	391	925	3,347	2,808	6,232	994	843	1,977
Bangor ..	530	687	1,020	4,196	6,175	7,428	1,249	1,802	2,098
Ballina ..	2,708	2,832	5,033	18,545	24,795	32,051	5,560	6,757	8,157
Sligo ..	627	609	817	5,140	5,106	5,750	1,642	1,600	1,689
Ballyshannon	548	301	591	4,436	2,523	4,566	1,507	768	1,329
Letterkenny	2,005	1,454	3,567	14,349	11,812	23,617	4,072	3,128	5,989
Dundalk ..	257	86	259	2,639	776	2,671	830	209	736
Drogheda ..	1,229	1,241	933	16,065	13,093	12,293	6,709	4,696	4,051
TOTALS	27,199	31,338	49,696	230,423	275,973	372,435	76,475	81,106	105,143

APPENDIX No. 16

Number, Quantity and Value of Sea Trout taken by Single Rod and Line in 1958, 1959 and 1960 by Fishery Districts.

Fishery District	No. of Fish			Quantity			Value		
	1960	1959	1958	1960	1959	1958	1960	1959	1958
				lb.	lb.	lb.	£	£	£
Dublin ..	1,466	2,700	1,576	1,244	2,040	1,497	206	291	227
Wexford ..	2,138	2,792	1,214	1,421	1,600	878	214	222	129
Waterford ..	1,204	1,024	1,138	963	805	883	142	117	125
Lismore ..	289	349	940	642	322	715	51	49	102
Cork ..	4,637	6,396	4,183	3,487	5,416	3,853	527	784	558
Kerry ..	7,952	5,584	6,846	9,240	6,600	8,307	1,372	952	1,198
Limerick ..	4,132	2,458	1,882	3,592	1,955	1,455	548	304	213
Galway ..	651	408	982	574	352	879	109	55	154
Connemara	8,849	8,361	6,756	8,275	7,431	6,050	1,328	1,186	822
Ballinakill ..	2,258	2,144	4,222	2,281	2,254	4,098	380	378	667
Bangor ..	3,801	3,277	4,525	3,406	3,016	3,977	517	449	551
Ballina ..	2,114	1,985	1,001	2,068	1,737	823	325	261	108
Sligo ..	341	126	187	274	106	207	48	16	31
Ballyshannon	648	556	524	692	653	459	106	94	49
Letterkenny	3,345	2,587	3,265	3,214	2,435	3,169	458	352	418
Dundalk ..	708	919	278	579	866	165	101	145	60
Drogheda ..	1,569	3,768	1,125	1,411	3,950	1,160	269	641	179
TOTALS	46,102	45,434	40,644	43,363	41,538	38,575	6,701	6,296	5,591

APPENDIX No. 17

PARTICULARS OF RECEIPTS AND EXPENDITURE OF BOARDS OF CONSERVATORS FOR THE YEAR ENDED 30TH SEPTEMBER, 1960

Fishery District	RECEIPTS						EXPENDITURE					
	Opening Balance	Licence Duty	Fishery Rate	Grant from Department	Miscellaneous Receipts	Total Receipts	Salaries	Water Keepers	Law Costs	Travelling and Miscellaneous	Total Expenditure	Closing Balance
	£	£	£	£	£	£	£	£	£	£	£	£
Dublin ..	—264	1,886	248	700	274	3,108	1,232	338	136	1,342	3,048	—204
Wexford ..	91	1,540	1,447	250	149	3,386	681	1,676	1	1,197	3,555	—78
Waterford ..	—648	3,376	2,681	3,000	315	9,372	1,500	4,360	225	3,449	9,534	—810
Lismore ..	768	1,668	5,811	1,500	262	9,241	1,251	6,505	125	1,896	9,777	232
Cork ..	2,135	2,120	982	4,000	147	7,249	933	4,316	196	2,015	7,460	1,924
Kerry ..	2,327	2,709	2,489	1,800	158	7,156	1,262	4,232	128	1,650	7,272	2,211
Limerick ..	4,616	3,694	3,253	2,700	513	10,160	1,226	5,465	441	4,417	11,549	3,227
Galway ..	2,034	864	2,664	400	148	4,076	2,005	850	137	1,055	4,047	2,063
Connemara ..	425	603	1,575	—	19	2,197	342	1,501	—	507	2,350	272
Ballinakill ..	45	436	1,323	150	9	1,918	377	1,031	—	470	1,878	85
Bangor ..	930	1,026	1,070	800	188	3,084	859	1,362	—	806	3,027	987
Ballina ..	669	1,081	3,310	100	287	4,778	592	3,582	117	688	4,979	468
Sligo ..	800	613	906	—	68	1,587	418	705	21	573	1,717	670
Ballyshannon ..	1,342	1,020	518	2,288	238	4,064	685	2,380	5	1,500	4,570	836
Letterkenny ..	1,437	2,362	1,891	524	220	4,997	756	2,854	34	885	4,529	1,905
Drogheda ..	649	1,520	1,444	800	17	3,781	615	2,369	59	1,526	4,569	—139
Dundalk ..	265	543	151	1,000	41	1,735	390	586	280	395	1,651	349
TOTALS ..	17,621	27,061	31,763	20,012	3,053	81,889	15,124	44,112	1,905	24,371	85,512	13,998

APPENDIX No. 18

PARTICULARS OF LICENCES ISSUED BY BOARDS OF CONSERVATORS FOR THE YEAR 1960

Fishery District	Salmon Rod								Special Local Licences (Tidal Waters)	Draft Net	Drift Net	Pole Net	Bag Net	Stake Net	Head Weir	Box or Crib	Loop Net	Snap Net	Gap Eye or Basket for Eels	Long Line for Eels	Oyster Dredge
	Annual (all districts)	Annual (district of issue)	Late season (all districts)	Twenty-one day (all districts)	Seven day (all districts)	Late season (district of issue)	Foyle Area extension (one district)	Foyle Area extension (all districts)													
Dublin ..	332	111	13	—	18	29	—	1	—	11	21	—	—	—	—	—	—	—	—	—	—
Wexford ..	126	125	—	—	103	67	—	—	—	105	—	1	—	—	—	—	—	—	1	—	—
Waterford ..	91	720	4	2	38	8	—	—	—	16	73	—	1	2	—	3	—	129	14	—	—
Lismore ..	61	261	6	2	275	—	—	2	—	11	61	—	—	2	—	1	—	15	1	—	—
Cork ..	211	249	7	—	147	50	1	—	—	51	15	—	—	—	—	—	—	—	1	—	—
Kerry ..	168	271	5	1	474	201	—	—	—	53	—	—	1	—	—	3	—	—	—	—	4
Limerick ..	114	775	—	—	28	20	—	—	—	93	67	—	—	4	—	4	—	—	36	20	—
Galway ..	31	40	32	—	162	27	—	—	—	7	—	—	—	—	—	5	—	—	35	7	75
Connemara ..	16	12	15	—	262	98	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Ballinakill ..	12	27	4	—	153	43	2	—	—	12	—	—	—	—	—	—	—	—	—	—	—
Bangor ..	51	37	13	3	321	100	—	—	—	31	2	—	1	—	—	—	—	—	1	—	—
Ballina ..	29	119	4	1	163	44	—	3	—	12	40	—	—	—	—	7	—	—	41	7	—
Sligo ..	54	97	8	—	18	2	2	—	—	9	—	—	1	—	—	—	—	—	1	3	—
Ballyshannon ..	24	61	2	—	113	13	23	26	9	58	1	—	—	—	—	2	—	—	5	3	—
Letterkenny ..	45	344	6	3	217	116	147	24	14	41	37	—	—	—	—	2	29	—	—	—	—
Dundalk ..	37	60	3	—	—	9	27	4	—	25	—	—	—	—	—	—	—	—	18	1	—
Drogheda ..	142	126	4	—	28	13	—	3	—	98	—	—	—	—	—	6	—	—	—	24	—
TOTALS ..	1,544	3,435	126	12	2,520	840	202	63	23	633	318	1	4	8	—	33	29	144	154	65	79

APPENDIX No. 19

Licence Duties Payable on Fishing Engines

	£	s.	d.
On each Salmon Rod—Annual (valid all districts) ...	4	0	0
Do. Salmon Rod—Late Season (valid all districts)	3	0	0
Do. Salmon Rod—Twenty-one day (valid all districts)	3	0	0
Do. Salmon Rod—Seven day (valid all districts) ...	1	0	0
Do. Salmon Rod—Annual (valid district of issue only)	3	0	0
Do. Salmon Rod—Late Season (valid district of issue only)	2	0	0
Do. Salmon Rod—Foyle area extension (valid all districts)	2	10	0
Do. Salmon Rod—Foyle area extension (valid district of issue only)	1	10	0
On each—Draft net	4	0	0
Do. —Drift net	3	0	0
Do. —Snap net	2	10	0
Do. —Bag net	10	0	0
Do. —Stake net	30	0	0
Do. —Head Weir	6	0	0
Do. —Box or Crib	10	0	0
Do. —Gap, Eye or Basket for Eels	2	0	0
Do. —Long line for Eels	2	0	0
Do. —Oyster fishing engine	2	0	0

Licence Duties Payable on Fishing Engines other than those Mentioned Above

Fishery District	Pole Net	Loop Net	Eel Trap	Special Local Licences	
				Rod	Draft Net
	£ s.	£ s.	£ s.	£ s.	£ s.
1. Dublin	2 0	—	—	—	—
2. Wexford	2 0	—	—	—	—
3. Waterford	2 0	—	—	—	—
4. Lismore	2 0	—	—	—	—
5. Cork	2 0	—	—	—	—
7. Kerry	2 0	—	—	—	—
8. Limerick	2 0	—	—	—	—
9. Galway	2 0	—	15 0	—	—
9[3]. Connemara	2 0	—	—	—	—
10[1]. Ballinakill	2 0	—	—	—	—
10[2]. Bangor	2 0	—	—	—	—
11. Ballina	2 0	—	—	—	—
12. Sligo	2 0	—	—	—	—
13. Ballyshannon	2 0	—	2 0	*3 0	*25 0
14[1]. Letterkenny	2 0	0 10	—	‡3 0	†12 10 ‡20 0
17[1]. Drogheda	2 0	0 10	2 0	—	—
17[3]. Dundalk	2 0	—	—	—	—

‡ River Lackagh Tidal Waters. * River Erne Tidal Waters.
† River Owenea Tidal Waters.

APPENDIX No. 20

PARTICULARS OF PUBLIC INQUIRIES HELD DURING 1960

Date on Inquiry	Where Held	Subject Matter	Minister's decision on considering Report of Inquiry
6th February, 1960	Dunmore East	More effectual government, management, protection and improvement of the herring fisheries off the coasts of Waterford and Wexford.	No action warranted.
25th August, 1960	Clarenbridge	Application for an oyster fishery order for a fishery to which an oyster bed licence applied.	Order granted

APPENDIX No. 21

ABSTRACT OF STATUTORY INSTRUMENTS MADE IN 1960

ORDERS AND REGULATIONS

Sea Fisheries Act, 1952 (Commencement) (No. 3) Order, 1960 (S.I. No. 3 of 1960), dated 5th January, 1960.

FIXING the 18th January, 1960, as the operative date for certain statutory provisions for the regulation of sea fishing, including provisions for the licensing of fishing vessels.

Licensing of Sea-Fishing Vessels Regulations, 1960 (S.I. No. 4 of 1960), dated 5th January, 1960.

PRESCRIBING 75 feet over all in length so that no vessel exceeding that length shall be used for sea fishing except under and in accordance with a licence applied for in the form in the Schedule to the regulations.

River Erne (Special Local Licences) (Amendment) Order, 1960 (S.I. No. 137 of 1960), dated 29th June, 1960.

PROVIDING that the special local licence duty payable in respect of a draft net for use in the tidal waters of the River Erne shall be £25.

River Erne (Special Local Licence Duty) (Method of Payment) (Amendment) Order, 1960 (S.I. No. 138 of 1960), dated 29th June, 1960.

PROVIDING that the licence duty in respect of a special local licence for the River Erne shall be payable in full on application.

Fishing Weir Operation (No. 4) Order, 1960 (S.I. No. 164 of 1960), dated 4th August, 1960.

AUTHORISING the Electricity Supply Board to resume operating without a free gap the fishing weir known as Cathaleen's Fall Weir, Ballyshannon, and requiring the Board to count fish taken in the weir and to release not less than four-fifths of the fish during fishing periods and all fish during other periods.

Oyster Fishery (River Shannon) Order, 1939 (Determination) Order, 1960, dated 4th November, 1960.

DETERMINING the Oyster Fishery (River Shannon) Order, 1939 (S.R. & O. No. 159 of 1939).

Oyster Fishery (Galway Bay) Order, 1960, dated 16th November, 1960.

GRANTING to the St. George Fishery Company Ltd., 9 William Street, Galway, the exclusive right of depositing, propagating, dredging and fishing for and taking oysters in that part of Galway Bay defined in the Order.

BYE-LAWS

Ballyshannon District Bye-Law No. 503, 1960, dated 6th May, 1960.

PROHIBITING all fishing for salmon and trout with any fishing engine other than rod and line in the tidal waters of the River Erne or of its tributary the Abbey River during each of the years 1960, 1961 and 1962.

Ballyshannon District Netting Bye-Law No. 504, 1960, dated 29th June, 1960.

PERMITTING the use of draft nets not exceeding 85 yards in length for taking salmon or trout during the period from 29th June to 19th August, 1960, in the portions of the tidal waters of the River Erne as specified in the Bye-Law, notwithstanding the prohibition contained in Bye-Law No. 503.

APPENDIX No. 22

OUTPUT OF OVA IN 1959/60

Hatchery	River system stocked	Salmon ova (,000)	Sea Trout ova (,000)	Brown Trout ova (,000)
Lismore ..	661,000 ova distributed to hatching stations throughout the State; remainder to Blackwater ..	1,039	—	—
Mallow ..	River Blackwater and tributaries	1,250	—	—
Inistioge ..	River Nore and tributaries ..	260	—	—
Killarney ..	Killarney lakes and tributaries ..	75	88	—
Loughrea ..	Lough Rea	—	—	65
Parteen ..	Shannon	2,809	—	—
Lough Ennell	Lough Ennell	—	—	70
Lough Owel	1,077,750 transferred to the Inland Fisheries Trust Inc.; remainder to Lough Owel	—	—	1,100
Fanure ..	Various Trust Waters ..	—	—	140
Oughterard ..	Lough Corrib and tributaries ..	—	—	280
Inver ..	Inver River System	—	46	—
Screebe ..	Screebe River	13	4	—
Ballisodare ..	Ballisodare River and tributaries	180	—	—
Ballyshannon	Erne	455	—	—
Lee ..	Lee	657	—	—
Glenties ..	341,000 salmon ova and 107,000 sea trout ova distributed to hatching stations throughout the State; remainder to Rivers Owenea and Owentocker ..	530	110	—
	TOTAL ..	7,268	248	1,655

APPENDIX No. 23

LIST OF SCIENTIFIC PAPERS, ETC., BY OFFICERS OF THE FISHERIES DIVISION PUBLISHED DURING THE YEAR 1960 (OTHER THAN THOSE APPENDED TO THIS REPORT).

McGRATH, C. J. "Dams as barriers or deterrents to the migration of fish." *Proceedings of Seventh Technical Meeting, Athens,* (1958), *of the International Union for Conservation of Nature and Natural Resources.*

HILLIS, J. P. & C. E. O'RIORDAN, "Parasites of the sunfish, *Mola mola,* from the Irish coast." *Irish Nat. Jour.* XIII pp. 123-124.

TWOMEY, EILEEN, "Notes on Irish char. (*Salvalinius spp.*) VII." *Irish Nat. Jour.* XIII pp. 134-137.

WENT, ARTHUR E. J., "Rare fishes taken in Irish waters in 1959." *Irish Nat. Jour.* XIII pp. 105-107.

————————. "A note upon the four-bearded rockling (*Onos cimerius* L.") *Irish Nat. Jour.* XIII pp. 178-179.

APPENDIX No. 24

HERRING INVESTIGATIONS ON THE SOUTH AND EAST COASTS OF IRELAND—1960/61

By
JOHN BRACKEN, B.Sc., Fisheries Division,
Department of Lands, Dublin.

Adult samples of herrings from Dunmore East, Clogherhead and the Cork area were examined. Beach-seining for whitebait (immature or small herring sometimes mixed with other species) was undertaken from Knockadoon Bay, Co. Cork, to Blackwater Head, Co. Wexford, during the period July-October, 1960. Monthly larval surveys were carried out from Fastnet, Co. Cork, to Carnsore Point, Co. Wexford, and northwards into the Irish Sea to Cahore Point, Co. Wexford. These surveys commenced in December, 1960, and continued until April, 1961. The exploratory vessel *Cú Feasa* was used for all surveys. In addition, surveys for clupeoid larvae were undertaken in April and May, 1961, in Waterford Harbour and the estuary of the Blackwater using a 1-metre stramin net.

1. *The Dunmore East Herring Fishery*, 1960/61: Fishing commenced on October 7th, 1960, and finished on January 19th, 1961. Ninety-six Irish-based boats using four types of gear engaged in the fishery and landings were made on 74 days out of a possible of 98. Altogether, 64,446 crans were landed by Irish-based boats during the season—an increase of 4,983 crans or approximately 8.4% over the corresponding figures for 1959/60. Ring nets accounted for 32,086 crans, the remainder being taken by vinge and larsen trawls and purse-seines. As in previous seasons, ring-nets caught the major portion of the catch before Christmas. After Christmas the landings by trawlers increased and predominated by the end of the season. Samples of herrings were obtained from October 11th up to the end of December. These samples were examined for length, sex, maturity and age. In addition, meristic characters were recorded including vertebral counts and otolith types. Table 1 summarises the age, distribution of fish examined.

TABLE 1—Age Distribution for 1960/61

Age in years	2	3	4	5	6	7	8	9	10	10+	Totals
No. of Rings	1	2	3	4	5	6	7	8	9	9+	
October	2	93	108	7	22	14	16	7	3	5	277
November	15	480	159	9	45	16	15	5	5	2	751
December	34	391	126	25	35	16	37	18	6	3	691
TOTALS	51	964	393	41	102	46	68	30	14	10	1,719

The dominant age groups were found to be 3 and 4 year olds. The 1957 year class entering as the recruit brood (3 year olds) was a very strong one which accounts for the small size of the major portion of the 1960/61 catches (the mean length of 3 year olds was 24.46 centimetres). The maturity stages were similar to those of the previous two seasons. In October, November and December the gonads were developing (mainly Stage V) becoming full in January (Stage VI). A small percentage of spents was present in the catches throughout the season. The maturities indicated that the normal fishing season was not over by mid-January. It is believed that inclement weather rather than a lack of fish was the major factor in bringing the season's fishing to a close earlier than in previous years.

The location and extent of the fishery in 1960/61 were very similar to that of the previous season. The shoals were first located N.W. of the Saltee Islands, close to the shore, in 10 fathoms. By mid-November estuarine fishing was again predominant and continued until mid-December. After Christmas, fishing was confined mainly to Baginbun Bay.

2. *Adult sampling from other areas*: The 1960/61 season commenced at Clogherhead in November and continued until the following February. Approximately 800 crans were landed by seven trawlers during the season. The main catch was taken in Dundalk Bay. A total of 1,088 fish were measured during the season and 360 fish, representing two lots of samples, one taken in December and the other in February, were examined for further racial characteristics. Since the February sample contained fish lacking suitable scales age distributions were obtained from the December sample only and these are summarised in the following table:

TABLE 2—Age distribution—1960/61

Age in years	2	3	4	5	6	7	8	Unreadable	Total
No. of Winter Rings	1	2	3	4	5	6	7		
No. of Fish	52	114	14	1	–	2	3	14	200

The dominant age groups recorded were 3 and 2 year olds. The length range of the fish was 14-30 cms., the dominant length groups being 18-23 cms. The racial and meristic characteristics obtained from these fish, particularly the first year length distributions and mean vertebral counts, were similar to those of the small winter component occurring in the Manx shoals and appear to belong to the same stock.

Samples from the Cork area were obtained at so irregular intervals during the 1960/61 season that they were of little value apart from

determining maturity stages and isolated age-analysis. It was not found possible to collect reliable catch/effort statistics in this area and, consequently, the age data could not be related to the effort.

3. *Beach-seine Data*: Samples of whitebait were taken on the south and east coasts during 1960 from July to October. The whitebait, which was composed of sprats and/or herrings, was used to determine the distribution of O-group herring from the suspected spawning areas on the south coast. Each sample was measured and vertebral counts taken for comparison with the adult data. All herring samples examined belonged to the Dunmore stocks and it is of interest to note that these samples included O-group herrings taken in the Irish Sea at Rosslare, Co. Wexford.

4. *Larval surveys off the south and east coasts*: Monthly larval surveys were undertaken from December, 1960, to April, 1961, using a modified Gulf III High Speed Tow net. The main catches were obtained on the January cruise when approximately 1,100 herring larvae (mainly stage III) were taken. A small percentage of larvae was taken in the southern Irish Sea and confirms the theory of diffusion from the spawning areas illustrated by the presence of O-group herring at Rosslare. Apart from the January survey, the catches of larval herring were small. The main concentrations of herring larvae, taken in January, were well inshore in close proximity to Cork and Waterford Harbour and the Blackwater estuary. The meteorological data for the winter months showed that strong S.W. winds prevailed and it was felt that the paucity of larvae during the surveys might be due to their dispersal into these sheltered areas. Accordingly, arrangements were made to have samples taken in future in these estuaries by means of a 1-metre stramin net.

APPENDIX No. 25

SALMON MOVEMENTS AND FISH PASS DESIGN

By
C. J. McGrath, B.E., A.M.I.C.E.I., Fisheries Division,
Department of Lands, Dublin.

To speak of design in relation to fish passes is invariably taken nowadays to imply that major engineering structures are under consideration both as regards the obstacle to be overcome by the fish and the means to be provided to enable them to do so. Principles of design, however, apply with equal force and are just as important for the smaller type of obstruction whether natural or artificial.

There is general agreement that the three main requirements to be fulfilled by the design are:—

Attraction—to provide sufficient outflow to enable the fish to find the entrance to the pass and to induce them to enter.

Suitability—to provide flow conditions in the pass agreeable to the fish and in no way detrimental to fish movement.

Capacity—to cope with the numbers wishing to avail of the facility whenever they wish to do so without impeding their movement by a hold-up due to overcrowding.

For upstream migrants outflow of ample volume and particularly of adequate velocity in relation to general water flow in the surrounding areas is the significant factor. It is essential that the fish shall experience no difficulty in finding this outflow which should accordingly be located in their path to the obstruction or be easily discovered in their wanderings below it. This requires that the outflow should preserve its identity for some distance away from the fish pass entrance and for this purpose depth of the outflowing stream is as important as width.

The literature on the subject from various countries discloses lack of uniformity in the relationship between the outflow from fish passes and that from adjoining discharges. This is understandable in view of the great variations there are in the sizes of rivers, the volume and pattern of flow in them and the extent to which impoundment and other factors influence these characteristics. In countries where there are large-flowing rivers fish passes are designed to operate with a flow of from ½% to 2% of the average flow which, of course, represents a considerable rate of discharge, whereas in Ireland the flow in fish passes constructed at the hydro-electric dams varies from about 1% to about 7% of the mean annual average flow of the rivers.

The extent to which special provision is made in many countries to augment the outflow from fish passes to increase their attractiveness to fish is well known. The present trend is to make use of every available and suitable source of discharge of water from power stations for this purpose. There are some grounds for believing that a discharge of a comparatively small quantity of water from a height onto the water surface at the entrance to the fish pass helps to draw the attention of the fish to the location of the pass outflow.

Attracting fish to the fish pass entrance is of such importance that it is suggested that, for major projects, experiments with models of the structure and its surroundings should be employed to an even greater extent than at present to devise the best arrangement for the site.

The arrangements made so far to attract downstream migrants into the fish passes at hydro-electric dams have been less successful than those for fish moving upstream. The difficulty would appear to be that the conditions obtaining above the dams do not provide the orientation required by the fish to help them on their way.

The suitability of the fish pass arrangement for the site is invariably a matter for debate. It would appear that no pass yet devised is free from criticism. Some of the larger fish passes built in Ireland in recent years, and indeed some of the smaller ones as well, have been criticised for delaying the movement of fish, both upstream and downstream. It has not been established, however, that this delay is due to any deficiency in the design of the passes.

In 1952, 1953 and 1954 some 3,000, 6,000 and 3,000 salmon, respectively, were counted passing up a fish pass of the White submerged orifice type built in Ireland. It has been noted, however, that, whenever there is a flow of water across the top of the baffle walls employed in this type of pass, many salmon prefer to cross the baffles in preference to going through the submerged orifice. Kelts are reluctant to move down through this type of pass and special measures have to be taken to help them on their way.

The Borland fish lock arrangement has been extensively employed in Ireland and has been quite successful in passing large numbers of salmon over dams of from 58 ft. to 97 ft. average working head. In many respects this arrangement can make most claim to be the ideal one for the passage of all types of fish from below an obstruction to above it. This claim has been greatly enhanced by the means devised by the Electricity Supply Board of Ireland to adapt it for the passage of elvers. There is, however, some room for improvement in the Borland type pass as regards attracting both upstream and downstream migrants into the pass without undue delay.

Experience to date in Ireland suggests that for depths of shaft greater than that at Leixlip, Co. Kildare, where the average working head is some 58 feet, the system of filling by discharge down the shaft is not fully satisfactory. The discharge most suitable to attract fish into the pass from the tail race is liable to create turbulent conditions in the bottom chamber that deter fish movement. Any reduction in this quantity of water to ease the turbulent conditions likewise reduces the attractiveness of the outflow to fish in the tail race. Some progress in overcoming this difficulty has been achieved by the Electricity Supply Board at Ardnacrusha on the River Shannon by the system of filling they have devised. The shaft is filled by means of a disperser unit located at the bottom and independently fed with water from the impoundment above the dam.

The use of horizontally opposed jets of water impinging against each other for this purpose is considered worth investigating further.

It is believed that the Borland fish pass arrangement could be made more effective by the provision of a fish pass of the conventional type as an approach to it. At the head of the conventional pass and the outlet of the Borland pass a holding pond for salmon would be provided. Salmon could pass upstream into this holding pond whenever they felt so inclined irrespective of whether or not the Borland pass was in the "fishing" stage of the cycle of operation. It is probable that, given suitable flow conditions, the fish could be induced to remain in this pond until the Borland pass once again reached the "fishing" stage in the cycle and, by being confined in this restricted area, they would be more subject to the influence of the discharge from the pass on the opening of the bottom gate and therefore more readily induced to enter. Such an arrangement could result in a reduction in the overall time of operation of the cycle by reducing the "fishing" period. Provision would have to be made, of course, to by-pass the discharge from the shaft when emptying so as not to injure the fish in this holding pool. The arrangement for by-passing this flow could be devised to augment the outflow from the approach fish pass so as to draw more attention to the pass and induce fish to use it.

It is an interesting speculation whether two approach fish passes could be built to lead from different parts of a tail race to one central Borland pass arrangement as described. It is suggested that the Denil pass would be a suitable one for this purpose. The modified form of this pass recommended by the Halcrow Fish Pass Committee has been extensively employed in Sweden, increased in linear dimension by some 142% while at the same time reduced in gradient to 1:6. Brown trout of as small as 0.4 lb. have successfully moved through such a pass when the flow of water through it amounted to one cubic metre per second.

A Denil arrangement in acordance with the recommendations of the Halcrow Committee has been built on a small river in County Cork at a slope of 1:4 and in two lifts of 8′ 6″ each. Fish have been recorded going through this pass ranging in size from a ¼ lb. brown trout to a 15 lb. salmon. Another Denil pass arrangement of a size representing some 114% linear enlargement of the Halcrow Committee recommendation and having a gradient of 1:6 has been incorporated in Galway Sluice Barrage. Many salmon have been observed negotiating this fish pass without difficulty.

It is only proper to record that some Swedish scientists do not like the Denil passes in their country and would prefer the submerged orifice type. Likewise some Dutch scientists criticise severely the Denil fish pass arrangements at barrages on the Rhine. These are not of the type recommended by the Halcrow Committee.

In the light of experience in Ireland to date attention is drawn to the fact that the Denil arrangement is a very efficient energy

dissipator and there may be a tendency to overlook this. It is a natural reaction to reduce the slope of the pass from that recommended by the Halcrow Committee to ease the passage for the fish. This can give rise to other undesirable effects such as reducing the outflow from the pass so that it is not as effective as it should be in attracting fish. It is suggested that the tendency to employ easier gradients than that recommended should be reserved for the uppermost stages in a multi-stage arrangement of fish passes on the Denil principle.

The capacity of fish passes has not heretofore received the attention in design it deserves. Recent advances in electronic fish counting arrangements should give a fillip to this aspect of the matter. In this connection there is need to ensure that the counting arrangements provided will not alone record numbers of fish but also when these occur as this will have a very significant bearing on the provision of capacity to accommodate, without overcrowding, all fish wishing to pass through at a particular time.

(6000).E31425/A.3.3.550.10/61.W.P.W.Ltd.9.